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ROENTGENOLOGIC DIAGNOSIS OF URETERAL STRICTURE¹

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ALTHOUGH urography offers the best method of determining the existence of ureteral stricture there are many factors involved which lessen the accuracy of this procedure. This is particularly true when the ureteral dilatation is moderate, or is confined largely to the portion of the ureter immediately adjacent to the obstruction. To add to the confusion, the outline of the normal ureter varies considerably. While it is well known that in most normal ureters there are three areas of comparative narrowing, this is not uniform, and the caliber of the normal ureter is variable in different portions. Added to this is the difficulty of uniform distention. While there is not a great amount of elasticity in the normal ureteral wall, nevertheless it does respond to complete and incomplete distention. Over-distention in one area with incomplete filling adjacent to it might easily give the impression of actual ureteral dilatation.

It is difficult to overcome return flow alongside the catheter, even with the use of large or Garceau catheters or bulbs. As a result, areas of apparent constriction may disappear when a second ureterogram is made with more complete distention. It should, therefore, be emphasized that, in cases in which there is any doubt as to the

ureteral outline, it is well to make a second ureterogram for the purpose of comparison.

The only visual evidence of obstruction is caused by dilatation which persists in repeated ureterograms. That ureteral dilatation occurs early is evident from the dilatation which is always found in the presence of ureteral stones, even when they are very small or when they have been present in the ureter but a short time.

It would be difficult to conceive how any obstruction could be present in the ureter for any length of time without such dilatation. It is true that the increase in the caliber of the ureter may be localized to the portion adjacent to the obstruction, frequently extending only 1 or 2 cm. above it. If such obstruction occurs in the lower portion of the ureter, the upper portion and the pelvis may appear normal. Even with widespread ureteral dilatation involving the lower two-thirds of the ureter, there may be no evidence of dilatation in the upper part of the ureter or in the pelvis or calyces. With obstruction in the lower part of the ureter the dilatation may involve the entire ureter and stop suddenly at the ureteropelvic juncture, leaving normal pelvis and calyces. In fact, this line of demarcation between the involvement of the ureter and pelvis occurs so frequently as to strongly suggest powerful sphincteric action on the part of the ureteral wall at the ureteropelvic

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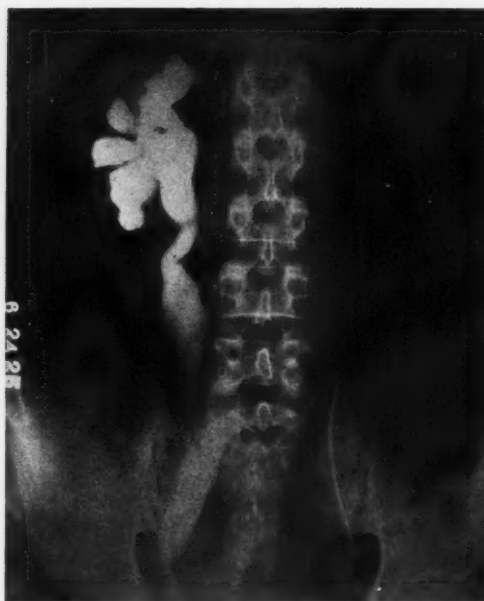


Fig. 1. Stricture of the lower third of the ureter, with ureterectasis and pyelectasis.



Fig. 2. Cicatricial ureter, with multiple strictures and areas of dilatation as a result of inflammatory changes in the ureteral wall.

juncture. When the sphincteric action is overcome by long-standing obstruction in the lower part of the ureter, the dilatation may be confined entirely to the calyces, leaving the true pelvis normal in outline. It is certain, however, that in most cases of ureteral obstruction of long standing, the calyces and true pelvis will be more or less involved; such involvement diminishes with the distance of the ureteral obstruction from the pelvis (Fig. 1).

Another factor which may confuse the interpretation of stricture is the dilatation occurring in the ureteral wall as the result of inflammatory changes or atony (Fig. 2). The deformity of the ureter may vary from scarcely recognizable irregularity to marked dilatation. The so-called "golf-hole ureteral orifice" in cases of renal tuberculosis illustrates the dilatation that may result from inflammation. It would be impossible for such dilatation of the ureteral orifice to occur as a result of obstruction; it can be ex-

plained only by inflammatory retraction of the ureteral wall. With diffuse, long-standing renal infection there is a variable degree of deformity in the outline of the ureter, depending largely on the degree and extent of the infection. Ureteral dilatation as the result of obstruction is usually greater than that which accompanies inflammation. If the ureteritis is of long standing, the outline of the ureter becomes markedly deformed. The deformity is usually characterized by alternating areas of constriction and dilatation as the result of coincident obstruction and atonic areas in the ureteral wall. The outline of the dilated portion may be markedly irregular, with evidence of filling defects and other manifestations of diffuse cicatricial changes in the ureteral wall (Fig. 3). If the dilatation of the ureter results largely from obstruction, it assumes a more uniform outline, particularly if there are single areas of obstruction such as occur with ureteral stone. The outline of



Fig. 3. Dilatation resulting largely from diffuse cicatricial changes in the ureteral wall.

the ureter with renal tuberculosis is usually characterized by irregularity throughout. Tuberculous ureteritis is usually accompanied by multiple strictures in the ureter, giving a markedly irregular appearance to the ureteral outline (Fig. 4). In cases of tuberculosis, should the primary stricture of the ureter occur in the lower portion, the ureter above may be uniformly dilated and without evidence of the usual irregularity in the ureteral lumen. In case of doubt, moreover, as to the cause of the stricture, in instances of tuberculosis there is always evidence which permits recognition of deformity in the outline of the renal pelvis and calyces. With long-standing infections of the bladder the adjacent portion of the ureter will frequently become involved to a variable extent and will as a result become dilated. This may be demonstrated by a cystogram made with the patient in the Trendelenburg position, the ureter then being outlined to a variable extent by the regurgitation of the medium.

Another factor which probably influences the dilatation occurring with ureteritis is temporary edema of the mucosa. It is con-



Fig. 4. Stricture of the ureter and cicatricial deformity in the pelvis and calyces, occurring with renal tuberculosis.

ceivable that with pyelo-ureteritis mucosal cicatricial areas in the ureter may become temporarily edematous so as to cause a considerable degree of obstruction. After the acute infection subsides there may be comparatively little evidence of actual obstruction.

Extra-ureteral factors may also be the cause of ureteral obstruction, particularly in the female pelvis, where either inflammatory or malignant tumors involving the pelvic organs may also involve the ureter. The clinical evidence of such disease, together with the urographic demonstration of areas of ureteral dilatation extending above the organs involved, will usually identify the condition. In the male, seminal vesiculitis sometimes causes both extra-ureteral pressure and secondary involvement of the ureteral wall.

Another factor which has recently been attracting attention as a probable cause of



Fig. 5. Stricture of the upper part of the left ureter which is probably accentuated by spasm in a case of pyelonephritis.



Fig. 6. Stone in left renal pelvis, with spasm at ureteropelvic junction; checked up at operation.

localized ureteral constriction is spasm of the ureteral wall (Fig. 5). That this occurs has been asserted by a number of observers. There is much evidence to lead us to believe that such spasm may exist. In a meeting of this Society at Detroit in 1922 I showed a series of slides demonstrating ureteral spasm in cases of stone in the kidney. Evidence of spasmodic constriction at or near the ureteropelvic juncture, with stone in the renal pelvis, is frequently observed. It usually occurs only in the presence of a single, comparatively small stone, situated in the true renal pelvis, and is probably the result of local irritation (Fig. 6). Adjacent and distal to the evident stricture at the ureteropelvic juncture a variable area of dilatation may be apparent. This dilatation is, however, more apparent than real, and seems to be compensatory to the degree of constriction. That such constriction is not actual was proved in several cases in which I had the opportunity of observing the ureter and pelvis while they were exposed during pelviolithotomy. There was no evidence of dilatation, nor could thickening or any other abnormality of the ure-

ter be demonstrated on palpation. Spasmodic constriction of the ureter is occasionally observed in hypersensitive patients as the result of irritation from the ureteral catheter. The constricted area will seldom be present in a subsequent film, and its temporary nature may thus be established (Fig. 7).

With stone partially occluding the ureter there may be spasmodic contraction of the ureteral wall distal to it. When the stone is situated in the upper or middle portion of the ureter, the portion of the ureter immediately below the stone frequently will not be outlined in the ureterogram, apparently because of spasmodic constriction of the ureter adjacent to the stone. Some time ago I called attention to the fact that hydronephrosis frequently occurs as the result of ureteral obstruction; this can be explained only by spasmodic constriction at the ureteropelvic juncture, similar to that observed in the esophagus with cardiospasm.

If the ureter is tortuous, as frequently occurs with renal ptosis or displacement, ureteral obstruction may be apparent in the



Fig. 7. Cicatricial ureter with apparent stricture in its lower third. While there are probably cicatricial changes at the ureteropelvic junction, the condition is accentuated by spasmodic contracture and resulting filling defect.



Fig. 8. Apparent kink in the upper part of the ureter. A second pyelogram made a week later shows a normal ureter; the kink in the first pyelogram was apparently due to a kink of the catheter.

ureterogram. The ureter may be dilated to a variable degree, throughout or in part. Definite areas of constriction may appear at the point where the ureter bends in its tortuous course; these will often disappear or assume variable positions in subsequent ureterograms (Fig. 8).

It is apparent, therefore, that the diagnosis of ureteral stricture by means of the urogram may be difficult. With so many factors involved, an unqualified diagnosis may be impossible. Furthermore, the personal equation is a significant element in interpretation. The ureter which to one person may

appear to be dilated to another may not necessarily appear so. A physician with wide experience, particularly one who checks the roentgenologic data at operation, will often hesitate to make a diagnosis of ureteral obstruction from the urographic evidence alone. Unless the changes in the ureteral wall are considerable and definite, it is questionable whether a conclusive diagnosis of ureteral dilatation can be made. Even with such dilatation, it is frequently questionable if one can determine from inspection alone whether the dilatation is obstructive, inflammatory, or spasmodic in character.

ROENTGEN FINDINGS IN SOME OBSCURE KIDNEY LESIONS¹

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BY the word "obscure" we do not mean to infer that the conditions to be discussed are in themselves particularly unusual, but that the causes underlying the atypical symptoms with which certain patients presented themselves, were not at first evident. Newgrowths of the kidney, renal calculi, nephroses, and ptotic conditions are of not infrequent occurrence, and are often easily recognized as being the basic factors concerned in the production of the patient's symptoms. However, the occurrence of these conditions with quite atypical symptoms is not uncommon, and in this paper we wish to discuss briefly some unusual findings in relation to the described symptomatology.

Ptotic, or movable, kidney is a condition commonly found in the under-nourished, and accompanied by more or less vague subjective symptoms. Among these are pain, usually dull and aching in character, gastric distress, and more or less polyuria. Often the ptotic kidney may be palpated. With such a group of symptoms and findings, the attention of the diagnostician is at once directed toward the genito-urinary tract and a diagnosis is established. The difficulty is that all cases do not present so classical a group of findings; the kidney is not always to be palpated, and the gastro-intestinal symptoms may overshadow those which might properly be assigned to the genito-urinary tract. This is illustrated in the following case, which was further obscured by a loss of weight which seemed more compatible with the presence of a malignant newgrowth than with the condition which was found.

Case 1. A woman of 58 entered the hos-

pital complaining of abdominal pain occurring one hour after eating, lasting about one-half hour, and occasional pain under the right scapula. She had lost seventeen pounds in weight in nine months. Her history was unimportant. Physical examination was negative except for some rigidity over the right side of the abdomen. Roentgen examination of the gastro-intestinal tract was negative. A pyelogram of the right kidney showed the pelvis to be somewhat enlarged, evidently due to a beginning hydronephrosis. With the patient in the erect position, the kidney descended to the level of the fourth lumbar vertebra, the ureter kinking sharply about 5 cm. below the pelvis. A nephropexy was performed, with relief of the patient's symptoms.

This case is of interest largely because the patient presented no genito-urinary symptoms. She entered the hospital with a history suggesting duodenal ulcer, and only in the course of a thorough examination were the facts disclosed which led to the relief of her symptoms. Particularly valuable was the roentgenogram of the injected kidney with the patient in the erect position. It was in this position that we were able to demonstrate the more or less rotated position of the kidney, and the acute angulation of the ureter which was responsible for the beginning hydronephrosis. The conventional pyelogram, made with the patient in the dorsal position, showed only a moderate dilatation of the pelvis, insufficient to explain the severity of her symptoms.

The picture of nephroptosis may even resemble that of calculus, presenting typical symptoms not at all resembling the ordinary case of ptosis. We think it clear that the following cases represent on the surface

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much more typical pictures of renal calculus than of ptotic kidney.

Case 2. This patient, a woman of 65, has had diabetes for six years. Two months before admission she had had a sudden attack of excruciating pain in the umbilical region, radiating to the left side of the abdomen. Morphine and chloroform were required for relief. After four weeks she had a similar attack, and two weeks later a third attack, described as the most severe of the three. Physical examination was essentially negative, there being only some tenderness and slight rigidity over the left side of the abdomen. X-ray examination was negative for calculi in the genito-urinary tract. The left kidney seemed to be somewhat enlarged. A pyelo-ureterogram showed a marked angulation of the left ureter, ptotic kidney, and a beginning hydronephrosis.

Case 3. A man 43 years of age entered the hospital complaining of a dull aching pain in the left upper abdomen, with intermittent attacks of colic-like pain, referred to the bladder area, and accompanied by pain on micturition and by cold sweats. The condition had begun three weeks previous to admission, the acute attacks occurring at intervals of four or five days, and lasting an hour or more.

Here we have a typical history of colic due to a renal calculus. However, he had passed no stones, there was no blood in the urine, and roentgen examination of the genito-urinary tract was negative. A pyelo-ureterogram of the left kidney in both the dorsal and erect positions showed a change in position of that kidney of nearly two inches, with a marked angulation of the ureter. The patient returned to work, symptom-free, after being fitted with a supporting belt. It is particularly noteworthy in this case that without the pyelo-ureterogram in the erect position, the patient's symptoms would not have been explained.

He had no hydronephrosis and no calculi, and, unless the ptotic condition of the left kidney had been recognized, no explanation of his pain could have been made.

It is evident from the foregoing cases that nephroptosis may occur without the classical symptom-complex, and that its recognition will sometimes require the most thorough and painstaking examination. The value of a complete roentgen examination of the genito-urinary tract, both before and after the injection of the ureters and kidneys with an opaque medium, is clear. As a routine, in doubtful cases, a pyelo-ureterogram should be made with the patient in the erect position. Unless this procedure is carried out, the degree of mobility of the kidney may not be determined, and the acute angulation of the ureter, responsible largely for the acute pain, will be missed regularly. To carry out this particular phase of the examination is often inconvenient, but the information obtained often repays one many times for the slight difficulties encountered. We have found it convenient to have two iron straps shaped to fit over the top of an ordinary vertical plate changer used in stereoscopic chest work, each strap terminating in a "U" over which the Bucky-Potter diaphragm may be hung. It may thus be adjusted readily to the patient's height, and the making of the roentgenogram becomes simple.

Hydronephrosis may be due to mechanical obstruction, to infection, or to tumor. It may be complicated by, or be secondary to, stone or ptosis. The roentgen characteristics vary, of course, with the degree of dilatation of the pelvis, all the way from an increase in the capacity of the renal pelvis, irregularity of the minor calyces, and broadening of the major calyces, to partial filling of the calyces, dilution of the injecting medium, and the presence of an enormous pelvis. As a rule, the recognition of

this condition presents no particular difficulty. The earliest changes are usually some irregularity or "clubbing" of the minor calyces, which an increase in the capacity of the renal pelvis. The roentgen findings are of particular value in these cases in distinguishing between a beginning hydronephrosis and a distended normal pelvis. If, for example, it is determined that a pelvis will contain 20 or 25 c.c. of fluid, the question is whether there is a mild hydronephrosis or simply a rather large normal pelvis which is distended to two or three times its normal size. The irregularity of the minor calyces, accompanied by a broadening of the major calyx, is the earliest evidence obtainable pointing to the existence of a hydronephrosis. Such a case, complicated by ptosis, is the following:

Case 4. A woman, 52 years of age, was admitted complaining of pain in the right renal area and tenderness in the right hypochondrium, and with pronounced nocturia. Physical examination was negative except for a general lack of tone in the abdominal viscera, and tenderness in the right upper quadrant of the abdomen. Roentgen examination showed no calculi. There was marked ptosis of both kidneys, which descended (with the patient erect) to below the level of the fifth lumbar vertebra. The right ureter was markedly dilated. The rotation of the right kidney was marked, as evidenced by the lateral direction of the calyces.

The recognition of a very large hydronephrosis may be rendered difficult by the presence of an obstruction to the passage of the ureteral catheter. It is not always easy to interpret the character of such an obstruction, and its nature may be cleared up by the making of a pyelogram. If the retained fluid is considerable in amount, the injecting medium will be diluted to such an extent that it will be very difficult to out-

line the pelvis of the kidney. The calyces may appear as detached, irregularly rounded areas, owing to the retention of undiluted fluid in a poorly drained calyx. In the presence of ureteral obstruction, even the smallest catheter may not pass it. Nevertheless, it is probable that at least some of the injecting fluid will enter the renal pelvis, enabling us to demonstrate the condition present.

Case 5. A man, 39 years of age, was admitted, suffering with extreme pain in the left renal area, with nausea and vomiting. He gave a history of past attacks of left-sided pain, associated with vague gastric symptoms and with bloody urine. The pain was referred to the left leg. He had had a ruptured appendix three years prior to the present illness, and had suffered some gastric distress for several years. Physical examination was negative, except for some tenderness on deep pressure over the left renal area. Roentgen examination of the genito-urinary tract disclosed a small area of slight density lying just below the tip of the left transverse process of the third lumbar vertebra. There was a large globular area of great density lying in the region of the lower pole of the left kidney, with a number of similar but smaller areas arranged in a crescent beneath it. Above these areas, after injection of the pelvis with sodium iodide, there was seen a large vague area of slightly increased density, which, it was thought, might represent a greatly dilated pelvis containing the iodide solution diluted in the urine. At operation there was found an enlarged kidney containing multiple calculi, and with an enormously distended pelvis containing 250 c.c. of fluid. There was a stricture at the uretero-pelvic junction.

This case is interesting from three standpoints: First, the enormous pelvis, the contents of which so diluted the injecting medium as to render the accurate outlining

of the pelvis impossible; second, the presence of the stricture producing the hydronephrosis; third, the presence of a large globular calculus. The diagnosis was rendered difficult by the fact that the shadow of the calculus was atypical, and by its location at so great a distance from the kidney pelvis as to render it uncertain whether or not the shadow represented a calculus or a calcified mass outside of the kidney. It will also be noted that although the catheter did not pass above the ureteral obstruction, the opaque fluid entered the renal pelvis and cast a shadow sufficient for the recognition of the hydronephrosis.

Case 6. A man, 27 years of age, was admitted, complaining of dull pain in the left upper quadrant of the abdomen of one year's duration. The pain sometimes radiated to the right side, but was not referred along the course of the ureter. Physical examination disclosed some tenderness in the upper abdomen, but was otherwise negative. The functional test showed a complete loss of function of the left kidney. Roentgen examination revealed the presence of multiple calculi in the left kidney, with beginning hydronephrosis, extra-renal pelvis, and a marked stricture of the ureter. The patient made an uneventful recovery after a nephrectomy.

One would expect that the change in the parenchyma of the kidney as a result of the presence of a renal tumor would affect, more or less, the outline of the renal pelvis. As a rule, newgrowth produces a greater degree of deformity than is observed with solitary cyst or polycystic kidney. The classical changes in the pelvis as a result of a newgrowth of the kidney are (Braasch):

1. Retraction of one or more calyces or of the true pelvis.
2. Encroachment on the pelvic lumen causing flattening of the pelvic outline, or narrowing of the calyces, or obliteration of the pelvis.

3. Secondary necrosis.
4. Abnormal position of the renal pelvis.
5. Deformity at the uretero-pelvic junction.

The ureter may be displaced as a result of pressure from the tumor mass, if it be large enough. The narrowing and retraction of the calyces, when present, is particularly characteristic of newgrowth. They may, in some cases, be retracted to very great lengths, and present what Braasch terms the "spider-leg deformity." By pressure and infiltration, the renal pelvis may be largely obliterated. Unfortunately, a renal neoplasm may be present without any of these typical findings. Instead of narrowing or obliteration of the renal pelvis, dilatation may occur as a result of necrosis or from retraction by the tumor.

Case 7. A poorly nourished man of 55 entered the hospital, complaining of pain in the left kidney area. He had been treated for nephritis two years previously, and said that he had had numerous attacks of renal colic. On physical examination there was found a palpable liver, and a large hard mass in the left upper quadrant, thought to be the kidney. The urine contained a trace of albumin, many pus cells, and a few red blood cells. Roentgen examination was negative for calculi. The pelvis of the left kidney was markedly enlarged, with marked clubbing of the superior calyces. This was thought to be due to a hydro- or pyonephrosis. The inferior calyces were normal. The left ureter pursued an anomalous course, evidently being displaced by the large mass seen in the left upper abdomen. Examination of the chest, spine, pelvis, and femurs was negative for any metastatic lesions. At operation there was found a large tumor arising from the lower pole of the kidney, displacing the left ureter. On pathological examination the tumor was found to be a papillary carcinoma.

Note that in this case the only roentgen findings were enlargement of the pelvis,

clubbing of the superior calyces, and an anomalous position of the ureter. These findings are entirely compatible with the diagnosis of hydro- or pyonephrosis, which was further supported by the presence of pus in the urine. The anomalous position of the ureter, however, was not thus explained, and probably should have served as the key to the correct diagnosis.

Another atypical case (Case 8) was that of a negro, 42 years old, who entered the hospital complaining of nocturia, paroxysmal cough accompanied by pain and vomiting, pain in back, and headache. He had lost fifty pounds in weight in six months. On examination, Argyll Robertson pupils were noted. The liver was slightly enlarged, and there was a mass in the left upper quadrant of the abdomen, tender to palpation. The prostate was slightly enlarged. The patellar reflexes were increased. The Wassermann reaction was positive. The phenolphthalein test showed the function of the left kidney to be markedly decreased. Roentgen examination of the genito-urinary tract showed the left kidney to be enlarged. No calculi were present. The pyelogram of the left kidney showed a very large lower major calyx, and a filling defect in the upper minor calyces. The shadow of a large mass was seen in the left kidney area, but its connection with the kidney was not established. There was no ureteral dilatation or obstruction.

The case was considered to be a probably malignant tumor of the left kidney. Because of the presence of some indefinite masses in the hilus region of both lungs, operation was not performed. Autopsy revealed a yellowish mass 8 cm. in diameter, with numerous similar smaller masses scattered throughout the upper portion of the kidney. Sections showed a papillary carcinoma.

This case, again, presented practically none of the typical findings of renal neoplasm. The presence of syphilis rendered the diagnosis more difficult.

CONCLUSIONS

In conclusion, may we suggest, first, that a complete genito-urinary examination, including roentgenograms before and after injection of the kidneys and ureter, be undertaken in all cases with unexplained abdominal pain; second, that, when indicated, such an examination should include pyeloureterograms with the patient in the upright position, and, finally, that many cases present highly atypical findings which require much careful study and consultation with the urologist for their correct interpretation.

We wish to gratefully acknowledge our indebtedness to Dr. Burnett W. Wright, Urologist to the Santa Fe Hospital, for valuable assistance and suggestions.

SPINA BIFIDA OCCULTA¹

ITS RELATION TO DILATATIONS OF THE UPPER URINARY TRACT AND URINARY INFECTIONS IN CHILDHOOD

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OPINIONS as to the clinical importance of lumbar and sacral spina bifida occulta are various and contradictory. Pybus (1) considers this the mildest form of spina bifida, and that it is usually symptomless. West (2), in his work in the Army, thinks that in the ordinary routine case of incontinence of urine in the adult, the condition of spina bifida occulta should be ignored, while Peritz (3) states that 68 per cent of adults and 55 per cent of children with enuresis have spina bifida occulta. Wheeler (4), in one thousand X-ray films of the lumbar region in white adults, found imperfect closure of the posterior vertebral arches in the last lumbar present in 2.3 per cent. Roederer and Lagrot (5) found the deformity of the first sacral posterior lamina in 9.9 per cent of one hundred cases in adults, and determined that one-third of one thousand instances where the bones were examined showed lumbosacral spina bifida occulta, and in one-fifth of this thousand cases it was the first sacral which was involved. So frequent a finding is it that certain observers have suggested that it might be but a variation of the normal and not an anomaly. This attitude toward the subject is thus tersely stated by Woltman (6): "Roentgenologists believe that spina bifida occulta is so common that it may be considered almost a normal variation which has little or no bearing on the cause for which the patient is referred for examination."

The fusion defect of the vertebral posterior laminae may be definite, distinct, and easily interpreted as visualized on the roent-

genogram. However, while there may seem to be a failure of fusion of the laminae on the film, at operation the vertebral arc may be found to be continuous and there may be but a failure of calcification; that is, there exists an anomaly of structure and not an abnormal morphology. The laminae may be of normal length but they may not be in the same plane. This deformity in the individual case may be of no clinical importance or may itself so flatten a portion of the neural canal as to cause cord pressure and remote nerve symptoms. In interpreting the doubtful film, a faulty direction of one or both laminae may enable one to draw the conclusion that a spina bifida occulta exists. Such findings, whether an abnormal bony structure or a defect in the direction of the laminae, are truly troubles of development which, while they may be limited to the bony abnormality only, may influence nerve supply to remote organs.

In the interpretation of a supposed embryological defect in the lumbosacral posterior laminae in the child, especial care must be exercised. First, often one experiences technical difficulties in obtaining stereoscopic films of this region which are entirely satisfactory; second, it is difficult to interpret with certainty the degree of bony malformation in many of these young patients and our experience would seem to indicate the usual error committed is to underestimate the size and extent of the hiatus, and third, fusion of the laminae of the lumbosacral vertebrae occurs at different ages and only when the child has attained the age of six or seven years is the fourth sacral segment completely ossified.

The observations of Christopher (7),

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Katzenstein (8), Nove-Josserand (9), and Brickner (10) indicate that in spina bifida occulta it is not the bony defect itself which causes the remote nerve symptoms, but that an added factor is present, in that the nerve fibers of the cauda are adherent to the superficial structures, or that there is present pressure upon the cord at the point of the spinal defect. Brickner enumerates the various conditions which may accompany a spina bifida occulta and cause remote neuromuscular symptoms, as follows: a distinct meningocele protruding through the bony cleft; a closure of the cleft by a tough membrane adherent to the skin; the perforation of the membrane by a dense band attached to the subcutaneous tissue externally and compressing the cord structures internally; fatty tissue lying within the canal concealed by this membrane; a bulging of the dura mater; an exostosis within the canal compressing the cord structures; a myofibrolipoma extending through the cleft into the bony canal, compressing the cord and its roots, and a degeneration of the cord tracts themselves.

The appreciation of the necessity for the presence of this added pathologic process before a spina bifida occulta may produce neurotrophic symptoms in remote regions—an essential change in the nerve structure, an adhesive band or pressure upon the cord—immediately explains why in one instance of spina bifida occulta there will be symptoms and in another there will be none, which fact suggests the need for a readjustment of our viewpoint concerning the significance of the presence of spina bifida occulta, and will form a basis for its more rational consideration in the future.

X-ray records of sub-dural injections of a shadow-casting substance (Sicard, 11, and Forestier, 12, François, 13, Wilmoth and Lagrot, 14, Chiray and Leclerc, 15, Sicard and Coste, 16) may demonstrate the evidences of cord pressure, locating the point

of compression when it is present in a spina bifida occulta. Leri (17) in his review states one can thus locate pressure upon the cord due to obstruction in spina bifida occulta, but that a negative finding by lipiodol injection does not necessarily mean that no obstruction and pressure exist, while Roederer and Lagrot (5) think that one can thus many times tell the difference, by the conditions accompanying the arrest of the fluid and the type of pressure figure secured, between essential cord changes and pressure changes. With the more extensive use of lipiodol as a means of visualization of the location of pressure upon the cord structures, there have appeared in the literature reports of ill effects from the sub-dural injection itself (18). These, with the observation that an existing pressure may not be detected by this method of diagnosis, would seem to indicate caution might well be observed in its employment.

The dependence of the urologist upon the roentgenologist and his complete study of the spinal lesion, is evident when one recalls the frequency of the co-existence of bladder functional symptoms and lumbosacral spina bifida occulta and the many instances where improvement or cure has followed the release of traction and pressure upon the cord structures (Brickner, 10, Dalziel, 19, Hackenbroch, 20, Delbet and Leri, 21, Nove-Josserand, 9, and others). The urinary symptom most frequently ascribed to spina bifida occulta is urinary incontinence, usually enuresis. Bladder retention, the result of a detrusor muscle paralysis due to spina bifida occulta, with or without the loss of bladder sphincter control, has been reported (Smith, 22, Chute, 23, François, 13, Cramer, 24). That the ureteral muscle may be paralyzed, with resulting ureteral stasis of urine because of nerve changes due to spina bifida occulta, has been proposed, but we have found no report of a case of dilatation of the ureters and ureteral orifices,



Fig. 1. Case 1, showing spina bifida.

with urinary reflux, in which a co-existing spina bifida occulta has been operated upon. However, Mucharinskis (25), Necker (26), Chiari (27), and Frankl-Hochwart (28) have each reported clinical study of such cases, with autopsy findings, and each has concluded that the presence of the spina bifida occulta, with disturbances of cord function as a result, contributed in the major part to the marked anatomical changes in the urinary tract; that the condition is primarily a neuromuscular dystrophy. Audler (29), experimentally producing such an anatomical change in an animal by disturbing its nerve supply, and Eisenstaedt (30), finding that the muscles to such a ureter removed at autopsy were atrophied, lend support to the contention that the change may be of neurotrophic origin.

Of the cases of urinary tract diseases in infancy and early childhood, which one of

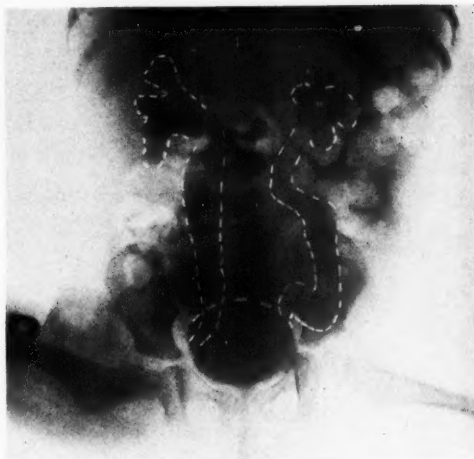


Fig. 2. Case 3, showing traced outlines of dilated ureters and pelvises.

us (H. O. M.) had occasion to examine, there were nine with marked and advanced anatomical changes of the upper urinary tract without demonstration of urinary obstruction. One had been operated on for spina bifida cystica, one had had a previous poliomyelitis. In the remainder there were no findings which could be considered as responsible for mechanical obstruction causing the marked distortion of the pelvis, ureters, and ureteral orifices. However, in each instance there was present a lumbosacral spina bifida occulta of varying degree. Stimulated by these findings, we dissected a seven-months fetus with craniorachischisis, excepting the second, third, and fourth sacral segments, which were covered by a fibrocartilaginous membrane.² There existed a left pes valgus and a bilateral dilatation of the ureters and the pelvis, the dilatation being greater on the left side, where it was six times the size of the normal ureter for a fetus of this age. This dissection data would seem to lend emphasis to a neurotrophic origin of the so-called "idiopathic

²It was through the courtesy of the Pathological Department of Indiana University School of Medicine that this material was made available.

congenitally dilated ureter," and in the light of the literature which we have reviewed, and in the presence of a constant finding in each clinical case of a lumbosacral spina bifida occulta, we submit the following cases

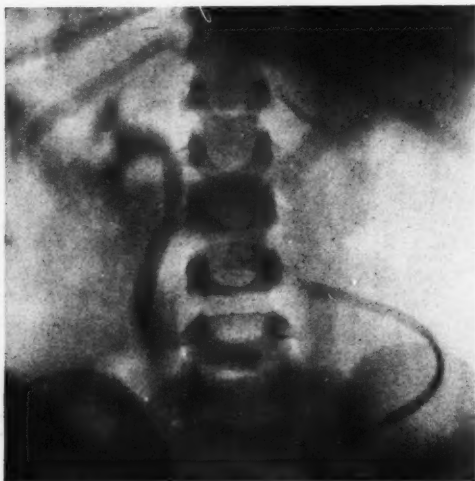


Fig. 3. Case 5, showing spina bifida.

as a preliminary report, feeling that there exists a relationship between the spinal lesion and the urinary tract changes, and that a neuromuscular dystrophy due to a spinal defect will best explain their presence in a certain number of cases of a similar type. Furthermore, we would urge close co-operation between the urologist, the roentgenologist, and the neurological surgeon in the detailed study of each case, as we feel that in this way only can the accurate relationship of cause and effect be ultimately determined.

CASE HISTORIES

Case 1. A female child, $2\frac{1}{2}$ years old, who had been previously operated on for a spina bifida cystica. The radiograph showed a fusion defect throughout the sacrum. There was urinary incontinence, vesical retention of urine, and reflux up both ureters, which were dilated.

Case 2. This three-year-old girl had infantile paralysis when 18 months old. There was paralysis of both rectal and vesical sphincters and bladder retention of urine. There was bilateral reflux, with dilated meatus, more marked on the right side. There was an absence of fusion of the laminae of the first sacral vertebra.

Case 3. A female child $1\frac{1}{2}$ years old. When one year old she developed a urinary infection. There was urgency of urination, enuresis, retention of urine in the bladder, and bilateral reflux, with dilatation of the ureters and pelvis. The roentgenogram showed the entire sacrum open.

Case 4. A child seven years old. There had been constant enuresis since birth, with some urgency of urination. There was bladder retention of urine, and left-sided reflux was present, with dilated left ureter and pelvis. There was incomplete fusion of the first sacral vertebra.

Case 5. A three-year-old girl with a dilated, distended right ureter and a very large relaxed right ureteral orifice. There was no comment in the history concerning the bladder, residual urine, and vesical sphincter paralysis or enuresis. The X-ray examination showed absence of fusion of the posterior laminae of the fifth lumbar.

Case 6. This three-year-old child has never walked, can speak but a few words, and has had constant enuresis since birth, with rather frequent day urinary incontinence. There was a small amount of residual urine in the bladder. Bilateral reflux, with dilated ureters and pelvis, existed. The film indicated a fusion defect of the posterior laminae in all the sacral vertebrae except possibly the second. At operation the sacrum was found to be open posteriorly throughout, and under the membrane covering this hiatus was a pad of fat, most marked opposite the first and second sacral vertebrae.

Case 7. This seven-year-old child had

marked vesical retention of urine, some dribbling of urine during both day and night, and both ureters and ureteral orifices were greatly dilated. There was a definite fusion defect of the posterior laminæ of the

amounts of residual urine in the bladder. Both ureters were very widely dilated. The radiograph showed a spina bifida occulta involving the fourth and fifth lumbar and all the sacral vertebræ.

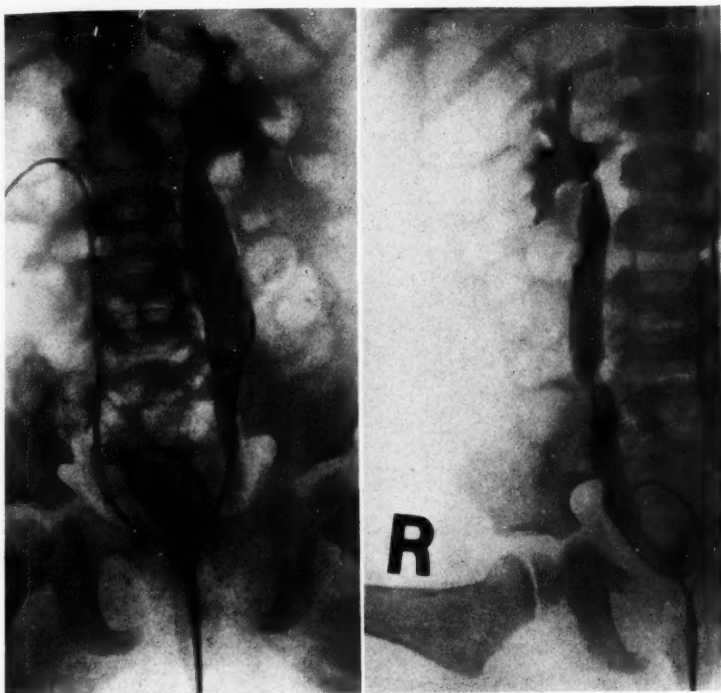


Fig. 4. Case 6 (two films), showing spina bifida and dilated right and left ureters.

first sacral, with probably the bony malformation involving the other sacral vertebræ.

Case 8. The history of this 3½-year-old female child is very incomplete. She had some day urinary frequency, with urgency. There was present a left ureterocele and the right ureter was fusiform in shape, greatly dilated in its middle, with no demonstrable evidence of obstruction at its lower end. The entire sacral canal was open on its dorsal aspect.

Case 9. This three-year-old boy had always been delicate. He had had constant enuresis and frequent involuntary urinations during the day. There were varying

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ANOMALIES OF THE URETERS AND THE KIDNEY PELVES¹

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ANOMALIES of all parts of the body are frequently found, but anomalies in the genito-urinary tract seem to be more frequent than in any other part, with the possible exception of the spine.

The roentgenologist, as well as the urologist, must know what anomalies may be

major calyces result. However, the extreme rarity of further extension of such a division into three or more pelves, with or without three or more separate divisions of the ureter, would seem to indicate that division of the ureteral bud into three or more major calyces would be infrequent.



Figs. 1 and 2. Normal pelves with two major calyces.

Figs. 3 and 4. Large middle minor calyces.

found in the genito-urinary tract and, on account of their frequency in this region, constantly have them in mind when interpreting roentgenograms.

Nichols says that the pyelographic findings often decide the question as to whether or not surgery is indicated, and that errors are perhaps most frequently due to failure to recognize congenital anomalies of the kidney pelvis. We will not attempt to discuss all of the anomalies of the kidney pelves and ureters, but will speak particularly of the double kidney and duplication of the ureters.

Mertz has shown that occasionally the primary division of the pelvis may vary, three or four primary divisions in the ureteral bud may be present, and three or four

We are not of necessity particularly interested in the embryologic questions as to when or by what means this division takes place. We do not need to decide whether it is a development of separate anlage or whether division occurs from above downward. Whether division takes place from above or below does not concern us, but we should know that division does occur and we should recognize the condition when present. The condition of double kidney, with duplication of the pelvis or partial or complete duplication of the ureter, is, no doubt, frequently present, and is often the seat of disease.

This condition is frequently unrecognized, as is indicated by the report of Mertz. He says that many cases are discovered only at autopsy, and that of those diagnosed during life and before operation, the diag-

¹Read before the Radiological Society of North America, at the Thirteenth Annual Meeting, at New Orleans, Nov. 28-Dec. 2, 1927.



Fig. 5. Partial division of kidney pelvis.



Fig. 6. Double pelvis.



Fig. 7. Pyelogram of opposite kidney. This is a double kidney with hypernephroma of lower half.

nosis was made only after repeated urologic and roentgenologic examinations. The typical normal pelvis of the single kidney has two major calyces, the superior major calyx being long, straight, directed obliquely upward and inward. The inferior is larger, shorter, and more horizontal, and has a tendency toward an oblique downward and lateral direction. The extent of

the division between the two major calyces, involving the entire pelvis or including the ureter in varying degrees, results in the bifid pelvis or in the partially or completely duplicated ureter.

According to Young the pelves of the double kidney are always situated one above the other, the division being transverse. We believe the division may be longitudinally through the kidney, with one pelvis anterior and one posterior, and in Figure 13 we show what we believe to be such a condition.

The normal kidney pelvis must always be kept in mind as a pelvis with two major calyces, and, as Papin suggests, when a median calyx is present it is a minor calyx and only when by chance it opens in the angle between the two major calyces does it appear as a major middle calyx. With these facts in mind, if, in studying a pyelogram, we find a large amount of kidney substance above or below the injected pelvis, we should remember that we may be dealing with a double kidney and that further investigation may be necessary before we make a diagnosis of tumor of one pole of

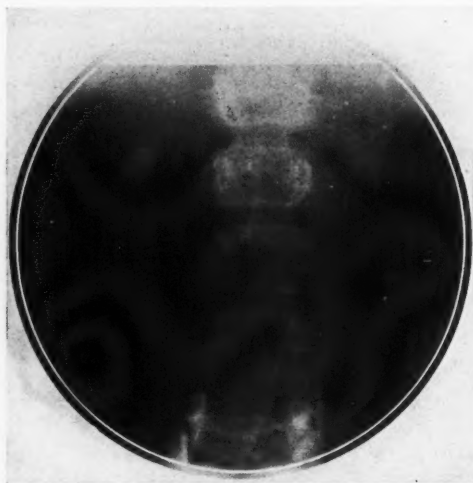
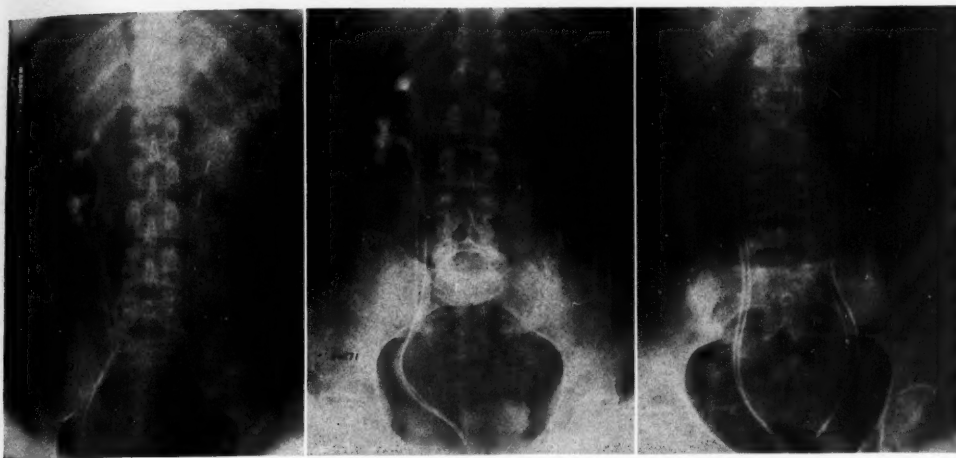


Fig. 8. See Figures 9, 10, and 11.



Figs. 9, 10, and 11. Double kidneys with partial duplication of ureters and complete duplication of ureters, both unilateral and bilateral.

the kidney. Any communication between the two kidney pelvis being very unusual, ureterograms must be made in order to show the other pelvis, to rule out the possibility of duplication of ureter and pelvis.

One cannot discuss anomalies of the uri-



Fig. 12. Double kidney pelvis with partial duplication of ureter.

nary tract without reviewing some of the essential points of the embryological development of this system. It is sufficient for our purpose to recall that the adult kidney is the final stage in the development of three embryological kidneys—the pronephros, the mesonephros, and the metanephros. The first two degenerate, while the third remains as the permanent kidney. The second begins to develop while the first degenerates; the third while the second degenerates; thus constructive and destructive processes are going on at the same time. The metanephros has its origin from two separate sources—the secreting part comes from the metanephrogenic mass, which is mesothelial in origin, and from this we have the development of the uriniferous tubules and the malpighian corpuscles. The efferent portion of the metanephros comes from the wolffian duct, and from this we have the development of the ureter, the renal pelvis, and the collecting tubules. The ureter develops as a budding on the lower end of the wolffian duct and extends outward from this portion, surrounded by the metanephrogenic mass of mesodermal tissue. As the renal bud extends outward, we have the foundation of the primitive pelvis, which,

in turn, divides into two portions, a cephalic and a caudal portion. It is ultimately surrounded by the metanephrogenic mass. There are times when there is a formation

of two ureters. It is very important to remember from the embryological point of view that the kidneys develop low down in the pelvis, and in the early stages of their



Fig. 13. Pyelogram of opposite kidney showing what appears to be a longitudinal division of the pelvis.



Fig. 14. Trifid pelvis.



Fig. 15. Pyelogram with congenital stricture at ureteropelvic junction.



Fig. 16. Ureterogram with no opaque substance entering the pelvis.

development the pelvis points anteriorly. As the kidney develops it ascends gradually until it occupies its final resting place in the flank. As it ascends into the flank the kid-

ney rotates about ninety degrees on its long axis, so that eventually the kidney pelvis remains posterior.

CONCLUSIONS

1. Anomalies in the genito-urinary tract are frequent. Therefore their possible presence should always be borne in mind when studying roentgenograms of the genito-urinary tract.
2. When two or more kidney pelves are present it is probably of rare occurrence that there exists any direct communication between them.
3. Either the upper or lower pelvis may be the one injected, but in our cases it has usually been the lower.
4. The division of the ureter may be anywhere between the kidney and the bladder.
5. The division of the kidney usually is transverse, but may be longitudinal.



Fig. 17 (above). Unilateral fused kidney with the right ureter crossing to the left side.

Fig. 18 (below). Bilateral polycystic kidney.



Fig. 19. Kidney after its removal.



Fig. 20. Pelvis can be filled by pressure, but cannot be emptied by suction.

6. In doubtful cases ureterograms should be made.

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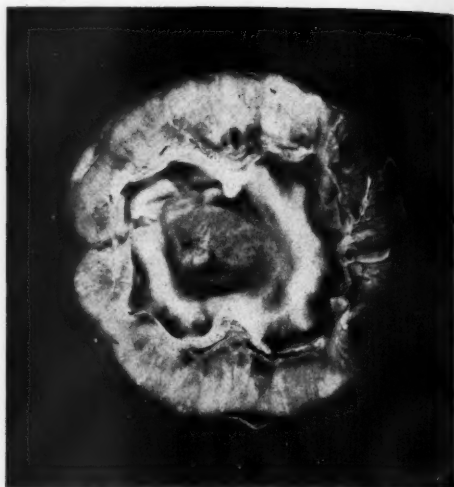


Fig. 21. The kidney laid open, showing pin-point opening between pelvis and ureter.

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Fig. 22. Horseshoe kidney. Both sides have double pelvises and partially duplicated ureters.

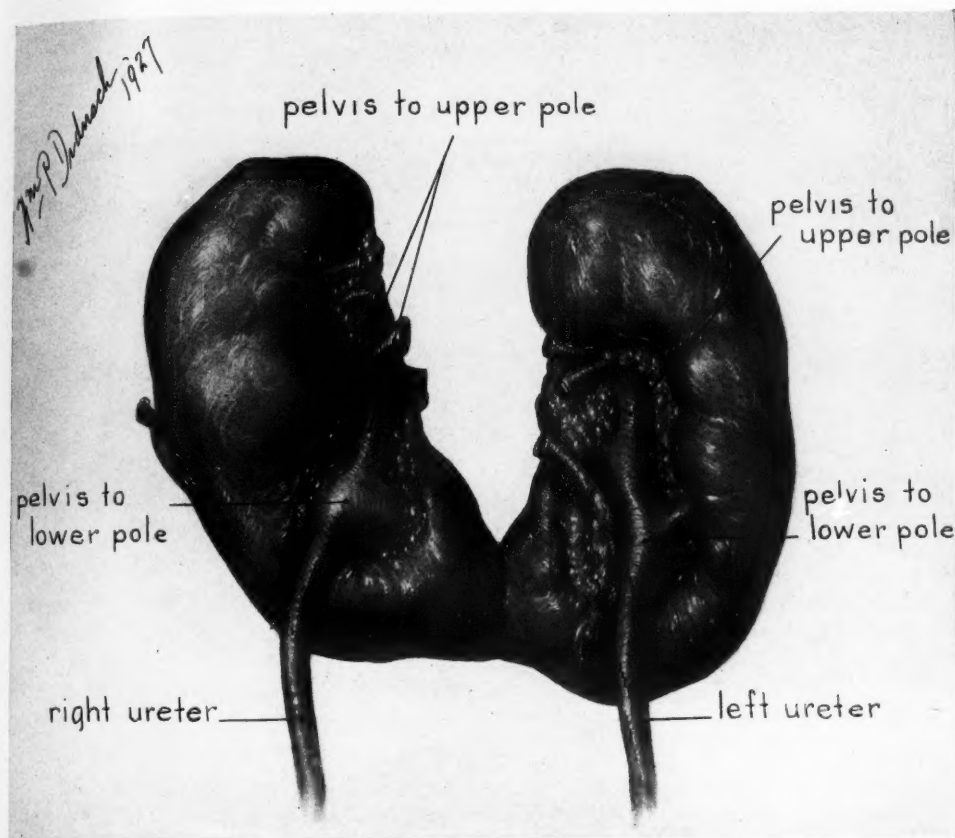


Fig. 23. Drawing of specimen shown in Figure 22.

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AN UNUSUAL FOREIGN OBJECT IN THE KIDNEY¹

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ALL roentgenologists in contact with a large turnover of patients encounter rare lesions of various kinds and unusual situations. This paper covers one such case which appears so out of the ordinary and presents a phase seemingly so unexplainable that it seems worthy of a report in detail.

A patient of Dr. William Miller of the Surgical Staff of Wesley Memorial Hospital, Mrs. C. D., aged 42, white, weighing 125 pounds, a native of the United States, came to the hospital in August, 1927, complaining of weakness, loss of weight, energy, and appetite. Four months prior to entrance she noticed a tender lump in her left side. She had lost ten pounds in weight during the previous two weeks. Three months before she had suffered attacks of abdominal pains, sharp in character, which occurred a few minutes after eating and lasted for about fifteen minutes. These pains came on intermittently and did not occur daily. Each attack was followed by a period of diarrhea. No relationship to any particular food was noted. She had the feeling of being bloated or distended with gas. One week before entrance to the hospital she suffered a particularly severe attack of pain in the pit of the stomach, which was followed by nausea and vomiting.

She complained of a lump in her left side which she had first noticed four months before, at the time she began to lose weight. She had had occasional attacks of left-sided pains since childhood. Ten years before admission she had had lumbar pain and pyuria, at which time she was told by Dr.

V. C. Lespinasse, attending urologist of Wesley Memorial Hospital, that she had a left-sided pyonephrosis. After that attack she seemed to get better and did nothing for this condition, remaining in fairly good health for the intervening years until the recent trouble. She had had five children, three of whom were living and well, and she admitted many self-induced abortions, the last one two years previous, from which she said she had never fully recovered. She had been curetted once but had had no abdominal operations of any kind. She related that ever since childhood she had been bothered by a recurring sharp stitch in her left side.

On physical examination, tenderness over the gall-bladder region was elicited and a tumor mass was palpated in the left side of the abdomen. This was thought at first to be an enlarged spleen. The liver was enlarged, its lower edge being three fingers' breadth below the costal margin. The stomach was distended with gas.

A blood examination showed 3,700,000 red cells, 14,600 white cells, and 59 per cent hemoglobin. A negative Wassermann was reported. The urinary findings included the presence of albumin, pus, and blood cells.

X-RAY PHASES

Because of the nausea and vomiting and pain occurring immediately after eating, the patient was referred for an X-ray study of the digestive tract. No shadow evidence of an intrinsic or extrinsic lesion of any part of the alimentary canal was found on fluoroscopic examination or serial film studies, but there was noted a constant shadow in-

¹Read before the Radiological Society of North America, at the Thirtieth Annual Meeting, at New Orleans, Nov. 28-Dec. 2, 1927.



Fig. 1. The calculus and embedded needle are seen in the left upper quadrant.

crease on all films of the left upper quadrant, a shadow which differed from the shadows of the opaque ingested material. This shadow consisted of an increased density of the degree usually associated with a renal calculus. It was of an irregular, more or less rounded outline, and was accompanied by what appeared to be the shadow of a metal, straight-shafted needle, the eye of which was plainly seen. This needle shadow lay with its long axis transverse to the long axis of the body, the needle apparently overlapping or being buried in the shadow described above as of the density of a renal stone. Inasmuch as it seemed impossible that such a foreign object could lie within the kidney, it was felt that it must be located in the lumbar muscles or other soft tissues of the back, this idea being based on plain or two-dimension films, with the patient in the usual prone posture.

These incidental findings of the gastrointestinal examination were checked up by a subsequent X-ray study of the urinary

tract, in order to determine the exact significance of the unusual densities in the left upper quadrant. A stereoscopic visualization (which is routine in all my examinations of the urinary tract and gall bladder, or similar investigations) revealed the two shadows lying in the same plane in the posterior abdomen, this plane being identical with that of the shadow of the left kidney outline which was plainly visible. The shadow outline of the kidney indicated a very considerable enlargement of this organ and that it was of a decidedly irregular outline. It was easily apparent that one end of the needle was buried in the renal stone. The following X-ray report was thereupon made: "A renal calculus, about 1 cm. in diameter, is indicated in the left kidney. In this stone is embedded one end of a broken sewing needle about 3 cm. in length, which also lies in the kidney, and the needle appears to be corroded."

A further X-ray check-up was made in combination with a cystoscopic examination by Dr. Miller and Dr. Campbell. After clearing the bladder of a very turbid urine, a terrific inflammation of the bladder was noted and pus was seen spurting from the left ureteral orifice. A catheter was passed into the left ureter and 25 c.c. of a 20 per cent sodium bromide solution was injected. The resulting stereoscopic X-ray films revealed a pyelogram that indicated a diseased condition of the kidney, containing a stone and a metal needle, as previously described.

OPERATIVE FINDINGS

The patient was operated on in August, 1927, and a large, dilated, fluctuating kidney around which there was a great deal of inflammatory exudate, was removed by Dr. Miller and Dr. Campbell. Splitting the excised kidney in several directions, the stone and the needle were exposed and an extensive pyonephrosis exhibited, all the X-

ray findings being upheld. The pathological findings by Dr. Fishback confirmed the foregoing both macroscopically and microscopically.

The patient did not rally from the operation and died six days later.

The question of how the needle came to rest in the kidney pelvis is of great interest. It is probable that it preceded the formation of the calculus, but why the stone formed around only one end of the needle is also of interest. Three-fourths of the length of the needle was free of the stone formation. The patient had been questioned as to the occurrence of an accidental contact with the needle by stepping, kneeling, or sitting upon such an object, or the entrance of the needle into the hand or other part, but she knew of no such incident. As the needle lay in the renal pelvis and middle calyx, which is directly connected to the outside by the ureter, bladder, and urethra, the possibility of entrance through one of these passages is to be considered, in spite of the fact that no history of such an event was obtained. Recently a somewhat similar case was described in *Acta Chirurgica Scandinavica* (Stockholm), by E. Brattstrom, who relates a case of a boy, aged 13, in whom a surgical operation revealed the presence in a renal pelvis of two grass-straws, around which concretions had formed, resulting in symptoms of renal calculi. In explanation of this observation, the author advanced the hypothesis that the grass-straws had been introduced into the urethra, finding their way into a ureteral orifice, subsequently travelling upward to the renal pelvis. This may be the answer to the question in regard to the case which is the subject of this report, notwithstanding the patient's denial of sex irregularities.

SUMMARY

In attempting to explain the presence of the needle in the kidney pelvis, one has in

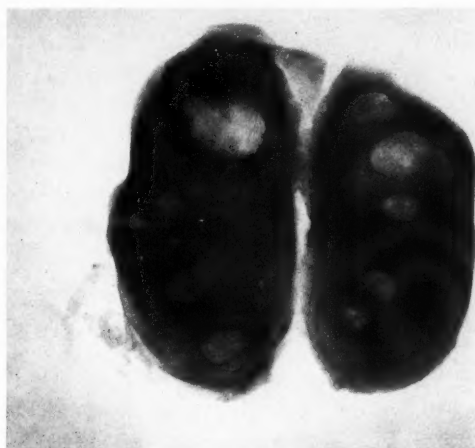


Fig. 2. The kidney, after removal, split open, showing an extensive pyonephrosis with the calculus and foreign body *in situ*, as in Figure 1.

mind the well known and frequently proven fact of long, slender objects entering the body at points far distant from their ultimate location, such as a needle entering the palm of the hand, later to be removed from under the skin over a scapula. However, such objects usually follow the planes of fascial coverings of long muscles rather than move through muscle bundles and organs at right angles to their surfaces.

The accidental finding by X-ray study of an unusual foreign object in the body is not an uncommon occurrence. In this case the symptoms pointed to a gastro-intestinal lesion, but the real condition was a pyonephrosis.

Stereoscopic visualization, routinely made in all examinations of the urinary tract, establishes the plane of any unusual shadow density, and permits a definite differentiation between intrinsic and extrinsic lesions. Thus, gallstones may be positively differentiated from renal stones by the fact that they lie in an anterior plane of the abdomen.

The mode of entrance of the needle into the kidney has not been proven in this case, but speculation on the matter associates with

it the "many self-induced abortions" in which the patient admitted having indulged. The technic used was not ascertained. The erotogenous hypothesis seems the more probable. It may be presumed that in young girlhood the needle was introduced into the urethra and that it accidentally slipped into the bladder, whereupon the patient feared to report the matter and later forgot it. But how a needle in the urinary bladder can enter the ureteral orifice and then pass upward to the kidney, against the normal movement of the urinary stream, is difficult to understand. A broken needle could be assumed to have entered the tissues by accident, but unbroken needles are most often intentionally introduced. In this case the needle was intact.

DISCUSSION

DR. B. H. NICHOLS (Cleveland): I am happy to have the opportunity of discussing the papers in this urological symposium, as some intensely interesting ones have been presented. The observations on "Spina Bifida Occulta and Urological Problems of Childhood," which have been made by Dr. Smith and Dr. Mertz, will alter the scope of a field of investigation in which all men doing urological work should be particularly interested, for further observations should be made of these cases of rudimentary spina bifida, so often seen in roentgenograms of the spine and sacro-iliac joint. It seems to me that the best plan for obtaining this information is by making a careful study of the history of childhood with reference to urinary symptoms and by the observation of children with rudimentary spina bifida who present urological symptoms. In this manner we shall be able to obtain some substantial statistics on this subject.

The paper by Dr. Potter and Dr. Sexton on "Anomalies of the Ureters and the Kidney Pelves" was extremely interesting and important because in it the authors present-

ed the possibilities of error in the pathological interpretation of cases in which the symptoms of disease may be simulated by an anomaly.

In speaking of Dr. Braasch's paper, I should like to take two or three minutes for the discussion of the problem presented by stricture of the ureter. This has been a subject of controversy among urologists, some contending that ureteral stricture is of rare occurrence. Our observation has been that definite strictures of the ureter are most often produced by tuberculous infection or anomalies of the ureter.

I am presenting two cases which show a congenital stricture or valve in the lower end of the ureter. In one patient, a boy 11 years of age, no evidence of spina bifida was found nor was there any valve or stricture of the urethra. The patient had severe pain, with incontinence, for many years, as well as definite symptoms of urinary disturbance. No correct diagnosis had been made, but cystoscopic examination revealed that both of the ureters were distended and that there was a large hydronephrosis on either side with congenital valves in both ureters.

The other case is a similar one in which anomalous valve-like obstruction of both the ureters was found. When we catheterized the ureter on the left side we found that it was distended. The ureter on the right side was completely closed and the primary X-ray examination revealed a large group of calculi in its lower end. By changing the position of the patient for each of the several roentgenograms made, we were able not only to demonstrate the various phases of the group formation of these calculi but also to identify them as calculi and not calcifications. At operation, a congenital valve which completely obstructed the right ureter was found in the lower end of this ureter.

Stricture of the ureter is a very interest-

ing problem, the solution of which we approach from the standpoint of the roentgenologist, believing that the ureters, like all similar cavities, have the power of constriction by means of a muscular reaction. Our procedure, therefore, is practically the same as that which we follow in the cases of duodenal ulcer. We make a series of plates while the ureter is emptying in order that we may show various peristaltic movements and at the same time show in all of the films that the stricture presents a constant filling defect. It is important that such an examination should be attempted only at a time when there is no irritation of the ureter such as is present immediately after catheterization.

We find that five or six ureterograms made in rapid succession will establish a satisfactory diagnosis of stricture of the ureter. We, therefore, heartily recommend such a procedure in any case in which stricture of the ureter is suspected.

DR. SAMUEL BROWN (Cincinnati, Ohio): In connection with Dr. Blaine's report, I would like to show you this film of a foreign body in the bladder. There was present a pin with a stone surrounding it. How that foreign body got in the bladder, I do not know; the only one who could tell us about it says that he does not know himself. He thinks he probably swallowed it or inhaled it. I leave it to your own imagination.

Now, regarding Dr. Mertz' paper, I wish to ask him whether he found any anomalies in the kidneys and ureters in adults with spina bifida? I know quite often I find the laminae of the left lumbar or first sacral vertebra are not fused together, and I am wondering whether those cases have anomalies as in the case of children. In children I find this quite frequently; that is, the fusion of the laminae has not taken place, but so far as I know there have

been no urinary symptoms which would occasion a urinary examination.

DR. A. U. DESJARDINS (Rochester, Minn.): The case presented by Dr. Blaine is most interesting. Just how the needle got there of course no one can tell, although it seems likely that it must have entered the body during childhood. At first sight the slides shown by Dr. Blaine gave the impression that the needle was embedded in the substance of the kidney and only a portion of it projected into the pelvis. However, Dr. Blaine's assurance that the needle was entirely free in the pelvis of the kidney makes me feel that the deposit of calcium on one end of the needle probably came about in the following fashion: When the needle first entered the renal pelvis it probably assumed a vertical position in the pelvis, with the lower end resting on the bottom of the pelvis near the orifice of the ureter. If we remember the sphincteric action of the upper portion of the ureter, we may realize that, as the urine passes down from the calyces, it collects in the lower portion of the pelvis until the ureter opens out to give it passage. After this the ureter shuts down and urine again collects for a few moments. Under such conditions the lower part of the needle must have been dipping in urine much of the time and the deposit of calcium around this end is readily accounted for. As you may have noticed, the calcium deposit was shaped very much like the head of an arrow. It is, therefore, possible, if not indeed probable, that the shape of this deposit was due to the urine level in which the needle dipped. Later, after the deposit had formed, mechanical factors probably forced the needle out of its original position into that shown by Dr. Blaine's roentgenogram.

DR. L. R. SANTE (St. Louis): I would like to call attention to one very interesting

foreign body, the case of a man who had been shot in the chest with a machine gun bullet during the War. At the time he reported to me for examination the bullet was undoubtedly in the lower portion of the liver. He had with him films that had been taken some two or three years before, showing the initial position of the bullet well above the diaphragm in the lung. This seemed remarkable to me and showed that foreign bodies with a sharp point actually can travel in the body. It is possible, it seems to me, that the needle in this case could have been introduced from outside and changed its position.

DR. L. T. LEWALD (New York): I have a case of an *unusual shadow on the right side*, occurring in a patient who was markedly jaundiced, and although I recommended that the case be withheld from operation until a differential diagnosis between a urinary condition and gall bladder should be made, such was not done. The patient was immediately submitted to a laparotomy. The gall bladder was found to be perfectly normal. It was not recognized that this concretion was in a peculiar location until an autopsy about two weeks later revealed the fact that it was due to a laminated *concretion in the renal vein*, really a phlebolith. The autopsy was performed by Dr. Leila C. Knox, and she found this in the renal vein, so that, as far as I know, it is a unique finding. Had a pyelogram been made, one might still not have differentiated the shadow from a calculus in the kidney. Even had a pyelogram been made and the pelvis distended, I think one would probably have come to the conclusion that there was a concretion in a distended pocket of the pelvis, but, that not having been done, it is possible one might have seen a very clear differentiation between this shadow and the filled pelvis.

I would like to say just a word about

foreign bodies. I would like to challenge any one to show a roentgenogram of a needle in one part of the body which had moved from another part, beyond an example such as we sometimes see of such a foreign body having moved slightly along a tendon sheath after attempt at removal. That is, I do not believe that beyond the length of the foreign body itself or twice the length of the foreign body, any one can show by any roentgenogram a *previous* location followed by *subsequent* location that was *remote*. The only case I know of, besides Dr. Sante's case, was duplicated by Dr. Walton Martin, a surgeon who served in the American Hospital in France. Among the war records there he found one case of a piece of shrapnel having entered the femoral vein and then being carried to the right ventricle of the heart. Now that is through a hollow tube and one can explain it. There is a case that I know of in which a needle was found in the heart of a child in the Presbyterian Hospital of New York. Now that and Dr. Blaine's case, I believe, are cases where the movement, as I say, has been for a distance of only once or twice the length of the needle by a direct perforation—say in the heart from a perforation of the esophagus or stomach, and the needle had then been forced through into the heart. In Dr. Blaine's case I do not know how to explain it. I had a girl once with three needles in the colon. It is possible, in Dr. Blaine's case, that the needle might have perforated through from the region of the splenic flexure, transverse colon, or small intestine and have reached the kidney in that way, although that is really very difficult to explain.

DR. H. O. MERTZ (closing): In answer to Dr. Brown's inquiry, I would say that I do not know. These plates have been read to us by the roentgenologists and they have made no notations whatever of the spinal

lesion and I simply cannot answer the question. It would be interesting for us to review our anomalies and see what the conditions of the spine are. I feel that it is not a spina bifida occulta that is responsible *per se*, but that the conditions we are discussing are the result of the accessory factor. If I may have the pleasure and honor of discussing the first paper just a moment, there is one point that has not been brought out which I think deserves to be. The roentgenologist should appreciate that there is a definite type for the caudal pelvis in a double kidney. The cephalic high lying knob-like pelvis, a little rudimentary pelvic shadow at the top of the kidney, each of us knows. However, the caudal pelvis follows one of the following three general types:

The first is that one in which the superior border of the pelvis is a continuous convex curve and ends in a calyx lower than the pelvis itself and far lateral. The superior major calyx is gone and its place is occupied by the cephalic pelvis.

The second type is one in which the superior major calyx is a rudimentary knob.

The third type is that one in which the superior major calyx follows an outward and upward direction and on the kidney shadow it will be seen that the calyx is so located that a part of the kidney shadow, the upper pole, could not be drained by this calyx alone. As the caudal pelvis is the one

whose ureter opens in a normal location in the bladder, when one of the two ureters is overlooked by the cystoscopist the probabilities are that it will be the ureter leading to the caudal pelvis which will be identified and catheterized and the caudal pelvis which will be pyelographed.

This emphasizes the importance of the roentgenologist having a clear idea as to the type of caudal pelvis in a double kidney if he is to be of the greatest benefit to the urologist in this anomaly.

DR. E. S. BLAINE (closing): My wonder was not that this stone had formed around the needle, but that it had formed on one end only. I have seen metallic foreign objects in the body entirely encrusted by stone-like material. Why did this stone form on one end only? A second point of interest is that this needle was not in the substance of the kidney, but was lying free in a renal passage. The stone lay in one part of a calyx, and the needle was in the renal pelvis and not buried in the kidney substance. A third point of interest is the manner of implantation of the needle. A slant on this is suggested by Dr. Hickey, who relates the case of a patient in whose abdomen he had found a needle, the patient having swallowed it by accident. This needle was buried in a piece of bread. This incident, however, can hardly be regarded as an explanation of the case which I have presented.

FRACTURES FROM AN OPERATIVE VIEWPOINT¹

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ALTHOUGH the operative treatment of fractures was made possible by Lister's demonstration that incision did not necessarily mean infection, it was not until 1894, when Sir Arbuthnot Lane began his pioneer work, that the procedure was considered seriously. Since then the literature has contained many discussions of the subject, and it would seem as though there is little left to be said. Two noteworthy and painstaking investigations have been made in the effort to evaluate the open and closed methods of treatment: one by the Committee on Treatment of Simple Fractures appointed by the British Medical Association and submitted in 1912 (10), and one by the committee appointed by the American Surgical Association and submitted in 1915 (3). A discussion of the subject should not be attempted without mentioning the chief conclusions reached by these two careful and discriminating committees.

The British report was, briefly, as follows:

1. The results of non-operative and operative treatment in children are practically the same: 90.5 per cent good function in the non-operative cases, and 93.6 per cent in the operative.

2. There is a progressive depreciation of the functional results from non-operative treatment as the age of the patients advances, that is to say, the older the patient the worse the result.

3. At nearly all ages, operative treatment produces a higher percentage of good results than non-operative.

4. Although the functional result may be good and the anatomic result indifferent,

the most certain way to obtain a good functional result is to secure a good anatomic result.

5. A method which does not definitely promise a good anatomic result should not be chosen.

6. In order to secure the most satisfactory results from operative treatment, it should be resorted to as soon after the accident as possible, and not following the failure of the non-operative measures.

7. The operative treatment of fractures requires special skill and experience and such facilities and surroundings as will insure asepsis.

8. The mortality rate directly due to the operative treatment of simple fractures is so low that it can not be used as an argument against operative treatment.

Finally, for surgeons and practitioners who are unable to avail themselves of the operative treatment, the non-operative procedures will remain for some time safer and more serviceable.

The foregoing conclusions were backed by a careful report filled with figures and percentages. It is clear that the Committee was convinced that the operative treatment of simple fractures gave better functional and anatomic results than the non-operative, but it is also clear that the members felt the promiscuous use of this method by those not properly trained or experienced or in poorly equipped hospitals was dangerous. In a keen and interesting discussion of this report, Sir Robert Jones said, "The indications for operation will clearly differ from the individual standpoint of the surgeon and no rules can be laid down. The surgeon with least mechanical resources will operate most frequently."

The report of the Committee of the

¹Read before the Radiological Society of North America, at the Thirteenth Annual Meeting, Nov. 28 to Dec. 2, 1927, at New Orleans.

American Surgical Association contains the following few points pertinent to this discussion:

1. Only 57 per cent of the patients treated non-operatively secure a good anatomic result, and of the whole number, only 65 per cent secure a good functional result.

2. Good functional results are much more easily obtained in children than in adults.

3. Operative measures give anatomic reposition in 72 per cent. Operation for anything short of complete anatomic replacement is not worth while, as the trauma to the soft parts seems to discount the improvement offered by any partial anatomic replacement.

In this report it also was plain that the Committee found the open treatment in the aggregate gave better results than the non-operative, but the Committee guarded the report in the same way as the British.

These two reports can be assailed on the ground that collected data of this kind are of questionable value; however, when gathered and studied as these data were by leaders in the profession, who submitted their reports only after careful study and discussion, their value must be recognized.

Previous to the World War, operation was probably performed too often; certainly too often by the inexperienced surgeon, and the many calamities which followed were justly criticized. Any good method when improperly used may be regarded as bad, when, in reality, it is not the method that is at fault, but the way in which it is used.

The War brought many more surgeons into intimate contact with the basic mechanical principle of the treatment of fractures, namely, fixation with extension. They saw the good results of well-applied conservative treatment carried out in well-equipped fracture wards by organized and trained professional and non-professional personnel, and the pendulum swung back to non-operative treatment.

The carrying out of traction, for example, for fracture of the femur by a Thomas splint, is simple when the nurses and attendants understand the basic principles. The surgeon soon realizes that to carry out this same treatment properly in a hospital in which such cases are rare and in which there is no trained personnel is difficult. Constant attention and supervision by one who understands is necessary. The busy surgeon cannot give the time, and he is, I believe, resorting more to the open method. From conversations with many surgeons concerned in the treatment of fractures all over the country, I find that they are operating in more cases of fracture than they were immediately after the War.

From an operative viewpoint, fractures may be divided into recent and old. In the former, operation is carried out for the purpose of anatomic restitution. In the latter, it may be for the same purpose as in cases of mal-union, for stimulating osteogenesis in the delayed union, or for awakening osteogenesis in cases of non-union.

INDICATIONS FOR OPERATION IN RECENT CLOSED FRACTURES

In this paper the discussion is limited to the simple or closed fractures. No hard and fast rule can be laid down as to just what type of closed fracture should be treated by the open method. The indications will always vary, not only according to the fracture, but according to the choice and training of the surgeon, and the conditions under which he is working. The surgeon of experience will know the type of fracture he can control by conservative methods, but will at once operate in the refractory case. I have been surprised to find in a considerable number of fractured shafts of the femur treated conservatively, that even though there was good line and normal length clinically, the fragments were still unhitched, and caught in the muscle and fascia. The

advice always to try conservative measures first in any given fracture seems irrational. The surgeon who has had training and experience and has at his command proper instruments and adequate asepsis will secure



Fig. 1. Lateral view after attempted reduction and limb held in plaster.

good results with surprising ease by operation. Perfect reposition of the fragments, restoration of the normal muscle balance, and the removal of the blood clot in cases treated by the open method result in convalescence that is remarkably free from discomfort. Operation, if performed before the extravasated blood has infiltrated into the soft parts and become partially organized, is much easier than if performed several days or a week after the accident. The report by Sherman, long an exponent of the plating of certain fractures, on the end-results in a series of seventy fractured femurs, is interesting, and shows what can be done by this method.

There may be some truth in the argument that delayed union or non-union is more common in cases treated by the open meth-

od, but this should not deter the surgeon if open operation is indicated. In certain fractures of the forearm, when there is considerable bleeding beneath the fascia, ischemic paralysis may ensue even if splints are not applied. Open operation relieves venous stasis and removes the danger of ischemia. Scudder gives a well-guarded answer to the question of when the operative method should be used: "Whenever the operative treatment is needed to secure the best results following a given fracture."

When one is confronted with the question of just what fractures should be treated by the open method, one is usually inclined to be indefinite. However, in view of the fact that I have been asked to discuss in this symposium the open treatment of fractures, I shall outline the fractures usually most satisfactorily treated by some form of open method in the Mayo Clinic.

Fractures in the lower extremities.—
(The prime factor is to obtain stability.)

1. Fractures of the astragalus, if there is marked displacement.
2. Pott's fractures wherein the internal malleolus is broken off high and well into the articular surface of the tibia.
3. Refractory fractures of the ankle, described so well by Cotton, wherein the fibula is broken spirally, the internal malleolus broken or the internal lateral ligament torn, and the posterior portion of the tibia broken vertically and obliquely or spirally so that the astragalus is permitted to wedge between the two tibial fragments. The foot is always displaced posteriorly (Figs. 1, 2, 3, and 4).
4. Spiral oblique fractures of the lower third of the tibia and fibula.
5. Fractures of the patella.
6. Most fractures of the shaft of the femur in the adult (Figs. 5 and 6), particularly those in the lower third with posterior displacement of the lower fragment.
7. Fracture dislocations of the hip.

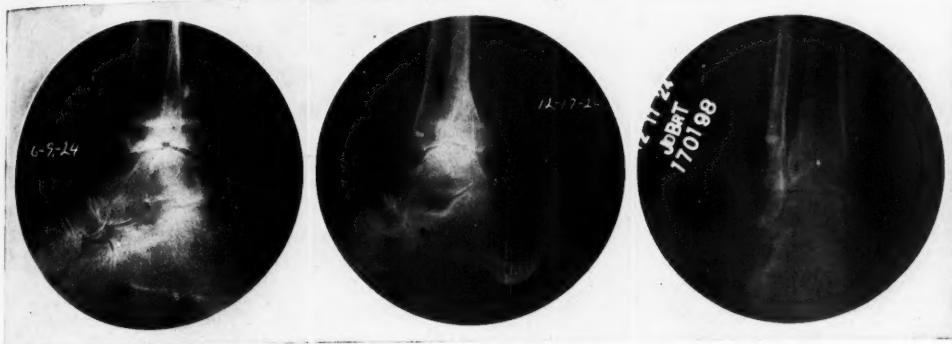


Fig. 2. Same as Figure 1, three months after open reduction. Beef-bone screw holding posterior fragment in position.

Fig. 3. Same as Figures 1 and 2, nine months after operation. Smoothing down of joint surfaces and gradual absorption of beef-bone screw.

Fig. 4. Antero-posterior view of same case as Figures 1, 2, and 3, nine months after operation.

8. Slipped epiphysis of the upper end of the femur in children (should be operated on early).

Fractures in the upper extremities.—
(The prime factor is to obtain mobility.)

4. Most fractures in the lower third of the radius other than the typical Colles type.

5. Most fractures of the head of the radius.



Fig. 5. Fracture of femur, with malposition, largely due to delay in institution of traction and fixation.

Fig. 6. Same case as shown in Figure 5, reduced, and held in place by beef-bone plate and beef-bone screws.

1. Overriding fractures of the metacarpals.

2. Badly comminuted fractures of the scaphoid.

3. Most fractures of the shaft of both radius and ulna.

6. Fractures of the olecranon process.

7. Certain fractures or epiphyseal separation of the lower end of the humerus in children, particularly if the lower fragment is displaced anteriorly.

8. Fractures of the surgical neck of the

humerus that are overriding (Figs. 7 and 8).

9. Fracture dislocations of the head of the humerus.

Delay in setting a fracture is responsible for faulty reductions more often than any

ideal type of open treatment, and when possible is the method of choice.

2. The ends of bone are replaced as discussed, and sutured together, either by absorbable sutures or wires. In certain spiral or oblique fractures, wire may be useful.

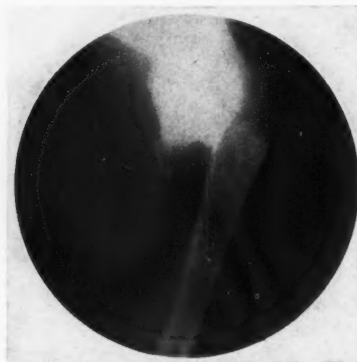


Fig. 7. Fracture of surgical neck of humerus, with outward displacement of lower fragment



Fig. 8. Same case as Figure 7, reduced by open operation. Fragments held in position with one beef-bone screw.

other factor, and therefore is often the cause of the operation. I (6) pointed this out in a discussion of the treatment of 270 recent fractures in which 123 had been subjected to the open treatment. These fractures included those referred for treatment up to four weeks after the break was sustained. Faulty position in close proximity to a joint also makes open reduction more often necessary. In fractures of the shaft, the percentage of cases in which functional results are poor is considerably lower than in fractures near the joint.

VARIOUS OPERATIVE PROCEDURES

The operative technic should be as simple as possible, no more being done than necessary to accomplish the desired result.

1. The fracture site is opened, the fragments replaced in normal line without internal splintage, but with maintenance of the position by external splinting. This is the

The wiring should not give the surgeon any false sense of security against the tendency to angulation.

3. Metal bands such as those of Parham and Martin, or of Putti, are useful in the oblique or spiral fractures, but it is necessary to have the proper instruments for applying them. It may be necessary to use more than one band to secure adequate fixation. They should be removed after union is secured.

4. Metal plates such as those designed by Lane and Sherman, in spite of severe criticism, are probably the best form of internal fixation for fractures of the shafts of the long bones. They are readily obtained, easily prepared, easily applied, and, when properly placed, rarely give trouble. They are strong and really hold the fragments in position. In the Mayo Clinic, strange as it may seem, more metal plates are used in old cases of mal-union and non-

union of the femur than beef-bone plates or bone grafts. Their application is expeditious and simple, and, although in a given case, for example, non-union of the femoral shaft, a bone graft might be more desirable from a physiologic viewpoint, this added advantage is more than discounted by the additional time consumed by the more elaborate technic necessary to place a bone graft.

5. Intramedullary beef-bone pegs are merely foreign bodies to provide fixation, and are not as much in favor as formerly. Intramedullary metal pegs should not be used.

6. Beef-bone screws and plates offer a convenient form of fixation for recent fractures. I use the bone screws with a great deal of satisfaction in spiral oblique fractures of the shaft, fractures of the patella, internal malleolus, olecranon process, and in the head of the humerus. With the proper instruments the screws are easily placed and ultimately entirely absorbed. The beef-bone plate also is usually completely absorbed, but in a few instances I have known it to become encysted and to resist absorption.

No matter what technic is used, adequate post-operative fixation must be provided. Too often results are wretched because little or no external support was provided after the application of a metal plate. A surgeon should not conduct an open operation for any fracture unless he is prepared to assume the responsibility of post-operative external fixation of the part. To relegate this to an inexperienced assistant is to invite failure. Attention and supervision are also necessary in order to determine the proper time when fixation may be abandoned sufficiently to permit of the earliest possible mobility of the joints, preventing stiffness and prolonged disability. In no other type of operation is it so necessary to have proper instruments. The correct sized

drills, the proper clamps to hold the bone, beef-bone screws of the proper size correctly threaded, taps to thread the holes in which the bone screws are to be placed, and metal plates of all types with screws to fit, must be at hand. The operation must be carefully planned beforehand. Delay at the operating table in securing the instruments means longer exposure of the wound to the air and increased chance of infection. Gentle handling of tissues is just as essential as in abdominal operations.

INDICATIONS FOR OPERATION IN OLD CLOSED FRACTURES

The old fractures that are matters of concern from an operative viewpoint are those due to mal-union and failure to unite. Either may be complicated by draining sinuses, a condition that must be overcome before corrective measures are instituted.

Mal-united fractures.—Mal-union can be remedied by osteotomy and correction of the faulty line. However, the maintenance of the corrected line is not an easy matter, for the soft tissues, muscles, and vessels are shortened, and when the extremity is straightened are stretched, constantly tending to cause recurrence of the deformity. Therefore, it is often necessary to provide some form of internal fixation. The metal plate, particularly in the larger bones, is the best means. Mal-union in an upper extremity is rarely the cause of any great disability unless it is close to a joint, as in the shoulder, elbow, or wrist. In a lower extremity, however, the problem of weight-bearing comes in, and if the weight is transmitted in a line that is excessively faulty, much inconvenience is experienced. This is particularly true of mal-united fractures in the upper or lower third of the femur and Pott's fractures in the ankle. If the mal-united fracture is compound as well, healing is necessary before any plastic work

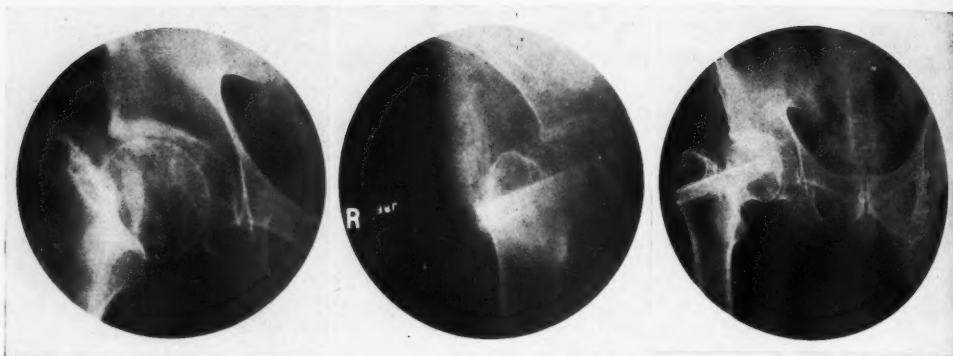


Fig. 9. Non-union of neck of femur of three years' standing. Male, aged 52.

Fig. 10. Same case as shown in Figure 9, immediately after open operation, freshening of fragments, removing of all fibrous tissue, and careful placing of the fibula as a peg.

Fig. 11. Same case as shown in Figures 9 and 10, two years after operation. Partial restoration of neck. Complete recovery, full function.

or osteotomy is undertaken. Sinuses must be explored, better drainage provided, if necessary, and sequestra, if present, removed. Metal plates should be placed in infected fields only when the fragments cannot be held by any other means.

Ununited fractures.—Ununited fractures may be divided into those delayed in uniting and those in a fixed state of non-union. Fractures in which union is delayed may be induced to consolidate by various means, but non-union (Figs. 9, 10 and 11) may be considered a fixed or terminal state, and nothing but operation will induce union (5).

So far as bony union is concerned, it makes little difference what type of operation is carried out in either group, because so long as the correct line is maintained, the chances are all in favor of union. In the case of non-union, however, one must deal with a physiologic as well as a mechanical problem. Osteogenesis must be awakened and to accomplish this the bone graft is the best means at our command. The intramedullary bone graft has practically been abandoned. The inlay graft, as advocated by Albee, is excellent in certain situations, but in the humerus, radius, ulna, and femur I have found it better to use the massive graft, because of the added advantage of its

size and of the stimulus to osteogenesis. The massive graft is a large piece of bone which may be taken from the flat internal surface of the tibia and has all the layers of bone. The irregular medullary portion of the graft is removed and the pieces saved, leaving the graft flattened in the form of a bone plate (Fig. 12). The cortex of the fragments is flattened by chiseling or sawing to provide a flat surface for the reception of the graft. By this means, the deep, cancellous, bleeding bone is exposed and the bone graft is applied as a plate to this surface rich in bone-forming properties (Fig. 13), and must be held firmly in position, just as a metal plate or a beef-bone plate is held. Beef-bone screws are excellent for this purpose (4). They are easily prepared, readily absorbed, and no time is wasted in preparation at operation. Albee and Campbell secure fixation by preparing autogenous pegs at the operating table.

The small pieces of bone that are removed from the medullary side of the graft should be kept warm during the operation and wedged in and around the fracture line after the graft is applied. I prefer to remove the bone graft from as near the epiphysis as possible, for the nearer the

bone to the epiphysis, the better the osteogenic properties. I make it a practice to scoop out with a curet a considerable amount of the spongy bone in the region of the epiphysis, and also to pack the frag-

change in the treatment of fractures. Sir Arbuthnot Lane, in 1894, began urging the open operation with internal metal fixation, for fractures. This was advocated by certain surgeons, and condemned by others.

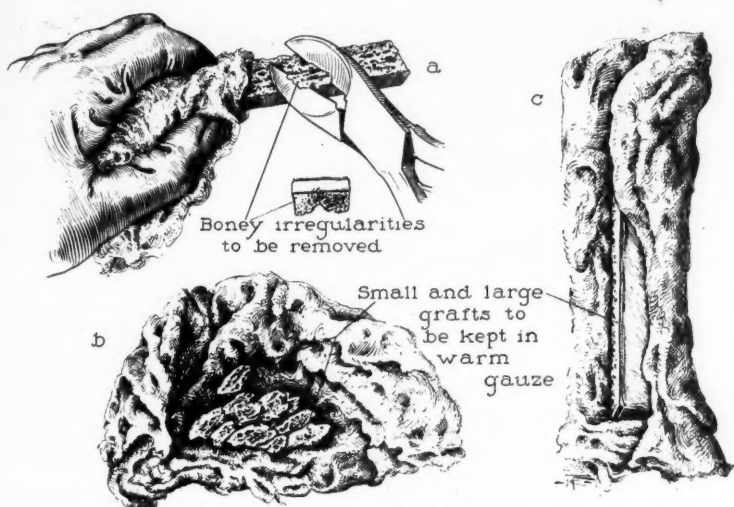


Fig. 12. Massive graft technic.

ments around the graft and the fracture line (Fig. 14).

I have been disappointed in the so-called osteoperiosteal graft, advocated by certain surgeons.

Post-operative external fixation is essential for all fractures. If a bone graft is used, it must be remembered that the weak period of the graft is from about the third to the fifth or sixth week, and fracture is likely to occur. During the process of repair, a good deal of the graft is absorbed and new bone deposited, and until an adequate amount of this new callus has formed and at least partially hardened or ripened, there is great danger of fracture of the weakened graft, with consequent displacement of the fragments.

SUMMARY

Until the new era opened by Lister, there was little opportunity for any radical

The method was probably used too freely previous to the World War, surgeons not being educated in its proper use. The War brought into prominence the conservative treatment of fractures, and the pendulum swung back probably too far in its favor.

The open method is being used more and more, but it should be employed only by those who are properly qualified and in the proper surroundings. The use of the open method as a routine is not advocated. Whenever possible, the conservative method should be used. In difficult and irreducible fracture the trauma incident to too vigorous manipulations, especially if anesthesia is used, is harmful. Immediate operation is preferred in such cases. The advice that all fractures of the shaft shall be subjected to conservative efforts as a routine, and that open operation shall be employed only after such efforts have failed, is irrational. The experienced surgeon will usually be able to

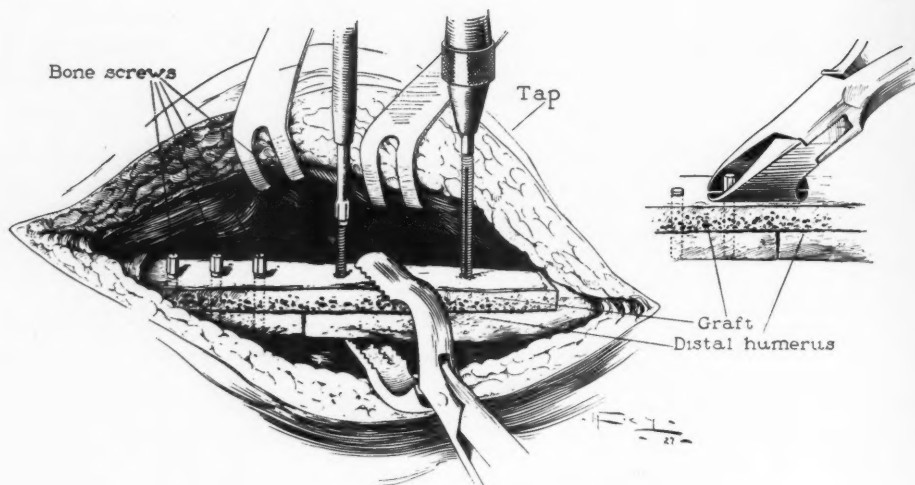


Fig. 13. Massive graft technic.

designate the fractures that can be reduced conservatively and those that will require open operation. There can be no difference of opinion about the treatment of old fractures. Either they must be left as they are, or open operation must be resorted to.

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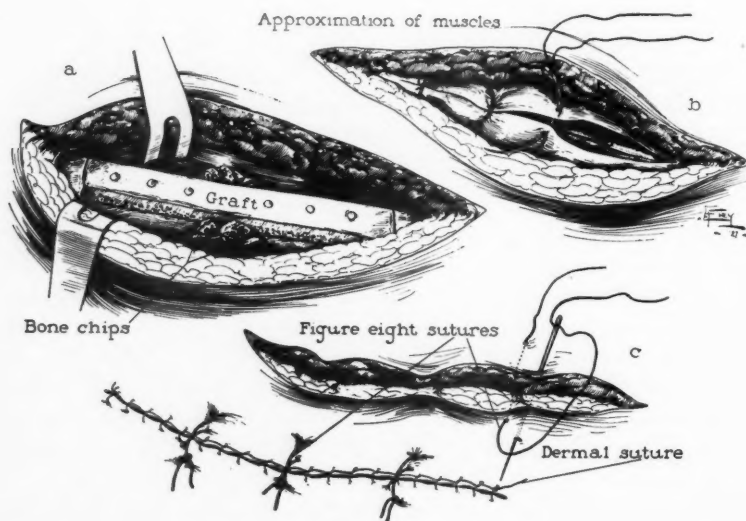


Fig. 14. Massive graft technic.

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FUNCTIONAL DISTORTIONS OF THE GASTRIC CONTOUR¹

By WALTER T. BRONSON, M.D., Department of Roentgenology, Northwestern University Medical School; Roentgenologist, Englewood Hospital, CHICAGO

MEDICAL science has in the last few years shown a marked trend toward a physiologic phase. This tendency is found in the scientific or research laboratory, where the effort is made to find physiologic phenomena which are contributing factors in producing a symptom-complex ordinarily indicative of organic pathology. It is also seen in the clinical laboratory, where the purpose of each examination is an attempt to arrive at some conclusion regarding the individual patient.

The art or science of radiology has logically and of necessity partaken of this type of study. The comparative ease with which some organs of the body can be studied by roentgen examination stimulates the effort to interpret physiologic function rather than merely to attempt to diagnose or locate definite organic lesions or to indicate an exact pathology.

The stomach is not only an important organ in the consideration of the individual's comfort and well being, but is also peculiarly adaptable in that it permits of study on the living patient with a minimum amount of discomfort. The various methods of determining function in the pathologic or physiologic laboratory can in a large measure be checked or controlled in the roentgen examination, by screen and film, in the course of which errors in size, contour, and muscular activity are easily demonstrated. The value of this study is obvious if due consideration is given the fact that all gastric symptoms express a disarrangement of function and may occur in the presence or absence of organic disease, for the main element in the production of gastric sensation is muscular tension.

An understanding of the various phases of muscular tension as shown by types of motility and contour, calls for an understanding of gastric innervation, not only afferent and efferent, but sympathetic as well. There appears to be some disagreement among the anatomists regarding the exact efferent response to a given afferent stimulus. However, it seems probable that there are two separate and possibly quite distinct nerve tracts that are responsible for muscular tone and action in response to, or sometimes irrespective of, a given stimulus.

It is apparent that purely local reflexes do occur in the stomach wall. The intrinsic ganglia are probably concerned, though the exact neurological mechanism is not known. Also, an efferent-afferent nerve phenomenon may result from a connection with the cerebrospinal axis. Sensory impulses from the stomach wall pass through the vagus (cells of origin in the ganglion nodosum) to the nucleus solitarius in the medulla. There an association neuron carries impulse to the dorsal motor nucleus of the vagus in the medulla. Motor impulse from this site is carried through the vagus to the intrinsic ganglia in the stomach wall. This stimulation or nerve impulse excites peristalsis.

Afferent sensory impulses from the stomach wall may travel through the white ramus communicans (splanchnic nerve), follow through the dorsal route (cell of origin in the dorsal root ganglion) into the cord, connecting with the cell body in the intermedio-lateral cell column of the cord; thence by fibers sent out by central route through the white ramus and the splanchnic nerve, ending in the celiac ganglion. Fibers from the celiac ganglion pass directly to the stomach wall, ending in the muscle. This

¹Read before the Radiological Society of North America, at the Thirteenth Annual Meeting, Nov. 28-Dec. 2, 1927, at New Orleans.

nerve impulse inhibits peristalsis. Inasmuch as either of these afferent or sensory pathways can be connected with either motor pathway by association neurons, it is possible for various stimuli to produce either excitation or inhibition of muscular contraction, which, unfortunately, may be a response that is not constant at all times for a given stimulus.

The work of Cannon, Carlson, Hurst, Reyfus, Alvarez, Ryle and others, who incidentally will be quoted *ad libitum*, has excited a new line of inquiry into the secretory and chemical phenomena of digestion. This automatically calls for a roentgen demonstration on the film or screen of physiologic changes in tone concurrent with physiologic chemical and secretory changes. If, as has been stated before, gastric symptoms are a reflection of gastric muscular tone, the demonstration of errors in muscular contraction as shown by altered size, shape, and activity may be translated into terms of gastric symptoms; and in the absence of definite organic lesions the information obtained from the observation of altered gastric tone may be of value in arriving at a clinical conclusion.

The normal variations in size, shape, and position of the stomach, corresponding to the status of the individual, are too well known to deserve further comment. The knowledge that deviations from these normal types are indicative of either organic or functional disorders is fundamental.

The sensation of hunger is dependent upon the tonus and peristaltic contraction of gastric muscle. Too prolonged emptiness of the stomach may result in peristaltic contractions of marked degree that not only cause discomfort and pain but create a false impression upon the fluoroscopic screen. Pleasant sensory stimulation by sight, odors, or sounds may create a false feeling of hunger with a resulting gastric motor stimulation. Similarly, false hunger may

be the result of hyperactivity of the gastric musculature stimulated by such intrinsic pathology as an ulcer.

A failure of tonal response by the gastric musculature may give, as a clinical manifestation, a loss of appetite or a failure of the hunger sensation; for example, the deficient appetite in the atonic tuberculous individual. Again, the loss of appetite accompanying gastric malignancies, particularly of the scirrhus type, may be due primarily to a failure of gastric tone. The disgust felt by some patients toward the barium meal concoction may be accompanied by a nausea, with a perversion of peristalsis. The nausea of pregnancy may cause a marked disorder in gastric motor function.

The functional errors secondary to intrinsic organic pathology are well known, though the fact may be overlooked that the immediate exciting factor of error is frequently physiologic rather than pathologic. Thus, the dilatation following partial pyloric obstruction may be due to food putrefaction, with a resulting muscular paralysis and relaxation. Or the hyperactivity of partial obstruction may be due to gastric irritation from the abnormal quantities of pure peptones that follow stagnation in this viscus, rather than to an effort to overcome the obstruction. It is often possible to make a correct diagnosis of intrinsic pathology, such as an ulcer, without a demonstrable error in filling, by the perversion of or marked variation in muscular contraction.

The presence of a sharp, pointed body, such as a pin, may be accompanied by a marked increase in peristalsis from the irritation of the pricking of the point, though in one reported case a complete absence of peristalsis was attributed to Nature's effort to forestall injury to the wall of the stomach. The modification of peristalsis from irritating foci of infection elsewhere, particularly in the gastro-intestinal tract, frequently in the adjacent gall bladder or close-

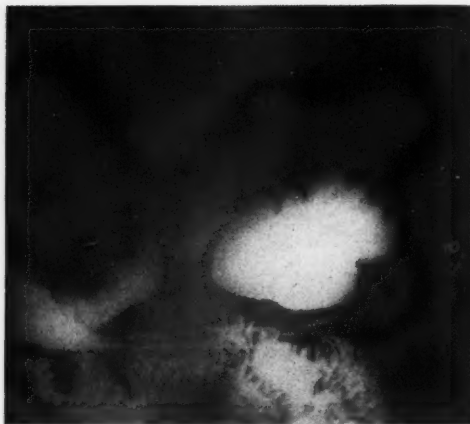


Fig. 1. Case 1, see text.

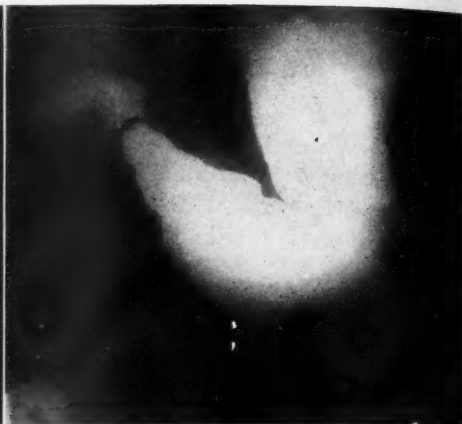


Fig. 2. Case 1, taken three months later than Figure 1.

ly related appendix, is often the final bit of evidence necessary to establish a definite diagnosis. The heroic efforts of the stomach to empty itself in early obstruction near the pylorus may be of value in determining the degree and age of the obstruction, and, in line with the purpose of this type of observation, may be of benefit to the patient in determining the type of treatment indicated.

It must also be remembered that hyperactivity is found more frequently in males, and that it is more pronounced in the prone position. The statement has been made that there is a more pronounced muscular activity normally present in individuals with exaggerated tendon reflexes.

Dietetic errors have been shown to produce grave degeneration in the musculature of pigeons, rats, and other experimental animals. Not only marked muscular atrophy but changes in the ganglion of Auerbach's plexus have been noted in pigeons fed on autoclaved food. It is reasonable to presume that similar, though less marked, changes may occur in the human in proportion to the degree of error. A series of experimental studies on the gastric muscular tone of rachitic children, with the

changes in the degree of error after treatment or medication, and a series of studies of normal students, temporarily on abnormal diets, further this belief. Unfortunately this work is not complete and so can not be reported at this time.

Some of the most marked variations from the normal gastric tone are found in errors of acid secretion, either with or without apparent organic lesion. Almost any degree of muscular contraction and tone has been demonstrated in stomachs showing a variation from the normal acid content. The hyperacid stomach may show either a hyper- or a hypo-muscular activity, while the stomach deficient in acid content may show similar marked changes in tone. The hyperactivity of the ulcerated stomach with a low acidity casts a shadow of doubt on the belief that the gastric irritability in benign ulceration is always a result of excessive acid content.

May this be a plea for a more painstaking observation of physiologic errors in gastric muscular function, with the object in view of interpreting such errors in terms of clinical manifestations of gastric disorders? Then it may be possible to remove the stigma of hysteria or neurasthenia from the

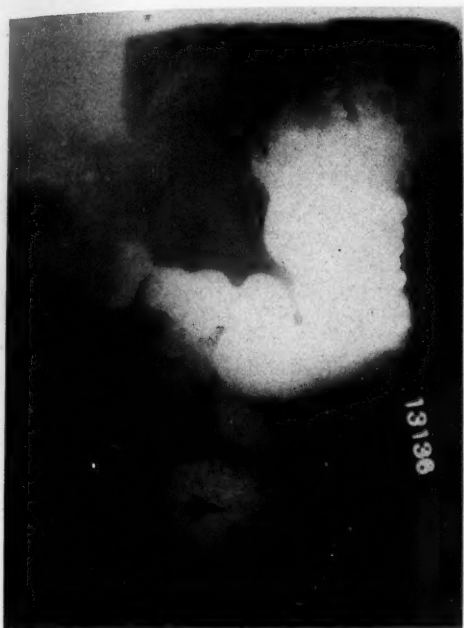


Fig. 3. Case 1, showing the condition some months later than Figure 2.



Fig. 4. Case 1, taken still later, showing irregularities in the antrum and on the greater curvature side of the pars media.

individual who fails to exhibit a definite ulcer crater or some other obvious organic defect.

CASE REPORTS

Case 1. A woman, 51 years of age, presented a classic clinical picture of a gastric malignancy. Laboratory findings also were typical, with a possible source of error in the gastric analysis, inasmuch as it was impossible to withdraw the test meal. Analysis of the vomitus secured at this time showed an almost complete absence of free and combined acid. In spite of the extreme illness of the patient, a roentgen examination of the stomach was attempted, with a screen and film image such as seen in Figure 1. This condition persisted throughout a rather protracted observation. Although the image at first suggested an extensive scirrhus carcinoma, there appeared to be more flexibility in the wall of

the stomach than would be anticipated if the pathology were an infiltrating malignancy. Figure 2 is a roentgenogram of the same patient, three months later, after no medication or treatment other than rather liberal amounts of dilute hydrochloric acid. There had been complete relief of all gastric symptoms, a gain of twenty pounds in weight, and an apparent clinical cure. Figure 3 shows the stomach some months later after a three weeks' vacation from acid medication. The patient refused to forego her acid medication longer, because of a beginning return of gastric symptoms. It will be noted that there is some narrowing of the distal third of the stomach. Figure 4 shows irregularities in the antrum and on the greater curvature side of the pars media that were found after another short vacation from medication. After each of these vacations, a few days of acid medication relieved all symptoms, and no error in size,

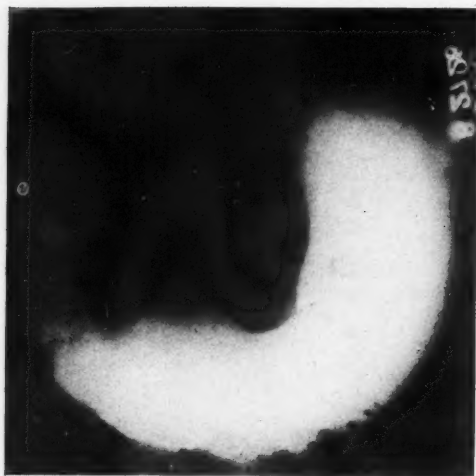


Fig. 5. Case 2, see text.

shape, or tone could be demonstrated by roentgen examination. The patient is apparently well two years after the original examination.

Case 2. A male, 45 years of age, with a rather atypical ulcer history and a marked hypo-acidity, presented a roentgen picture as in Figure 5. A peculiar mottling of the stomach shadow was thought to be caused by food remnants, as there was an enormous five-hour residue of the motor meal. However, this film was made at an examination immediately following a thorough gastric lavage. The defect in the bulb was present at all times and was not altered by atropine. An exploratory laparotomy revealed a small, almost pin-point ulcer in the duodenum. No resection or anastomosis was done. There was no relief from clinical symptoms by routine ulcer diet after the operation, until the hypo-acidity was corrected by the administration of dilute hydrochloric acid. Since this medication has been given, the relief has been so great that the patient refuses to submit to further X-ray examination. Figure 6 shows the five-hour residue of the motor meal.

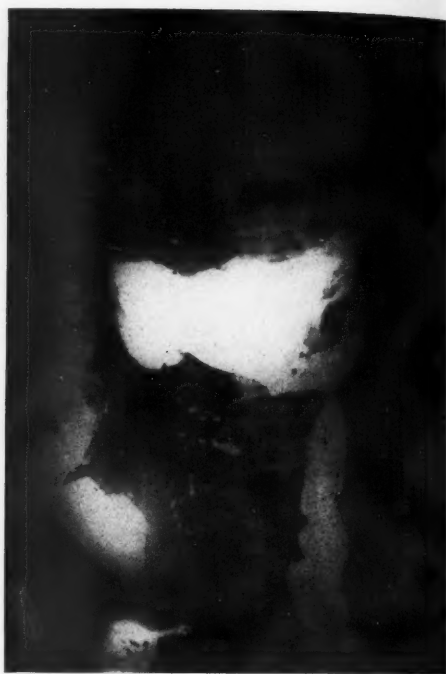


Fig. 6. Case 2, showing the 5-hour residue of the motor meal.

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DISCUSSION

DR. JAMES T. CASE (Battle Creek, Mich.): We have listened to a very interesting symposium on a very interesting part of the gastro-intestinal tract. It is highly important that all these matters be studied.

I was especially interested in the statement of Dr. Bronson that the presence of a pin or other sharp pointed body might make a marked increase in peristalsis from the irritation of the pricking point although I

believe he called attention to one case where there was a complete absence of peristalsis. This, he says, was attributable to Nature's effort to prevent injury to the wall of the stomach. This calls to mind H. Roger's statement about what happens to a pin in the small intestine. Roger, the famous French pathologist, stated that if a pin is inserted into the small bowel in such a way that the point will be directed distalward it will invariably be found very shortly turned around, going head-first along the

intestine rather than point-first. This was recorded about twenty-five years ago and explains why so many sharp pointed instruments go through the intestine without doing harm.

DR. BRONSON (closing): I have nothing further to add except to thank Dr. Crane and Dr. Orndoff for emphasizing the importance of considering external conditions as causative factors in producing gastric or abdominal distress.

THE RÔLE OF RADIATION THERAPY IN PELVIC INFECTIONS¹

By ALBERT SOILAND, M.D., WILLIAM E. COSTOLOW, M.D., and
ORVILLE N. MELAND, M.D., LOS ANGELES

FOR many years considerable attention has been given to the treatment with roentgen rays of various types of infections and inflammations. Numerous observers have reported beneficial results in boils, carbuncles, acute streptococcic infections, acne, localized tuberculous invasions and other types of localized infections. The most recent complete report on this subject is that of Holzkecht.

Roentgen therapy has also been used in pelvic infections, especially in the tuberculous and gonorrheal types. Good results have been reported by Theodor (1), Cassidy and Stumpf (2), Holzkecht (3) and many other observers. We are aware of the work which has been done with diathermy in these cases and it is undoubtedly of value in the gonorrheal type. However, the acute cases with large abscess formation may be aggravated by the internal heat if this is not cautiously applied. With the X-ray, there is not this danger of aggravating the inflammation, especially if the small doses which are indicated are used. In the pelvic cases, with localized abscess formation, it is often necessary to drain, as in localized abscesses elsewhere, but frequently this can be done by vaginal puncture, the remainder of the inflammation being taken care of by radiation; thus extensive mutilating surgery can be avoided.

Various theories have been advanced regarding the action of radiation in the treatment of inflammation. The general belief agrees with that of Pordes, that the rays have a direct destructive effect on the leukocytes in the inflammatory zone surrounding the inflammation, eliminating antibodies and bacteriolysins, which, being freed, be-

come effective in destroying the inflammation. Holzkecht (3), in a recent article, draws attention to the observation of Heidehain, that the blood and the centrifugate of fluid pus, after irradiation, exhibit an enhanced ability to dissolve bacteria. This, he observed, lasted three to six days, then disappeared and reappeared upon renewed irradiation. Undoubtedly there is some type of defensive reaction produced in the body by the rays, because we know that they do not have a direct destructive action on bacteria.

In the treatment of pelvic inflammation of the gonorrheal type, by means of the roentgen rays, there is never any indication for producing a permanent menopause. However, in the tuberculous type the production of the menopause may be desirable. Usually only a temporary amenorrhea is produced, or, by the method of Flascamp, Marum and Klasten (1), doses which are less than the amount necessary to produce temporary sterilization are used. In our experience we have not seen a permanent menopause in the gonorrheal cases we have treated. Brief histories of a few cases of gonorrheal pelvic inflammation follow.

Case 1. Age 27; married; one child. Two months before admission this patient developed a profuse yellowish leukorrhea, with burning upon urination. She consulted her family physician, who made smears of the leukorrhea and found gonococci. She was treated locally for about six weeks, with improvement in the local symptoms, but a week later developed pain in the lower pelvis, with fever, requiring her to be bedfast. Temperature ran from 100 to 104 degrees F. Examination showed the uterus to be fixed by a large tender mass in the right tubal

¹Read before the Radiological Society of North America, at the Thirtieth Annual Meeting, at New Orleans, Dec. 1, 1927.

region. Left tube was thickened, tender, but no definite mass was made out. She received roentgen therapy (200,000 K.V.; 40 cm. distance; 15×15 cm. fields over lower pelvis anterior and posterior; $\frac{1}{2}$ mm. copper and 1 mm. aluminum filter; total of about 20 per cent erythema dose given through each portal). Temperature remained above 101 degrees F. after the first treatment, and the patient was bedfast with ice bags to abdomen. A surgeon advised immediate operation, but this was refused. The patient gradually improved after the second treatment and in one month was entirely free from symptoms, only a small amount of induration remaining in the left tubal region. This was found to be entirely gone after another three weeks. Patient continued to menstruate for three months; periods disappeared then for eight months but returned again and are now normal after two years; no recurrence of the pelvic inflammation.

Case 2. Age 31; married; one child. Two weeks before applying for treatment the patient developed acute pain in the lower pelvis, yellowish leukorrhea, and fever, requiring her to remain in bed. Examination revealed induration in the entire posterior cul de sac; uterus fixed by large tender masses in each tubal region. Vaginal smears showed gonococci. The patient was treated alternately over front and back of pelvis every fourth day, using 200,000 K.V.; 40 cm. distance; $\frac{1}{2}$ mm. copper and 1 mm. of aluminum filter; 15×15 cm. fields. At each exposure about 10 per cent erythema dose was used. A total of three treatments anterior and three posterior was given. The temperature subsided before the treatments were completed, and the pain and soreness had practically disappeared. Two months later the patient's uterus was freely movable and no sign of the former induration or pelvic masses could be made out. Menstruation was not interfered with and the

periods are still normal. Two years later, the patient is still free from signs of pelvic inflammation.

Three of our acute cases were operated on before treatments were completed, one case shortly after the first treatment, on account of surgical advice. In these cases sufficient time was not allowed to determine the action of the radiation. In the cases with a chronic course and a small amount of inflammatory involvement in the pelvis, the response to radiation is exceptionally good. In many post-operative cases, with adhesions and a moderate amount of chronic pelvic inflammation, small doses of radiation will relieve the pain and clear up the inflammatory process.

Often with uterine fibroids there is a history of past pelvic inflammation, or some signs of tenderness and thickening in the tubal regions may be elicited. The fact that inflammation often accompanies fibroids has caused some surgeons to use this as an argument against the employment of radiation treatment. This may be a contra-indication if radium is used intra-uterinely, especially following a curettement. The curettement is probably more of a factor in stirring up the acute inflammation than the radium itself. We have treated many hundreds of cases with intra-uterine radium without seeing pelvic inflammation stirred up, and undoubtedly some of the cases must have had some previous pelvic inflammation. We believe, if there is a history of pelvic inflammation, or if definite signs of pelvic inflammation can be made out accompanying the fibroid, that radiation by means of the roentgen rays is not only entirely safe, but the best treatment for the inflammation. This is based on many years of experience in the treatment of numerous cases of fibroid tumors accompanied by signs of pelvic inflammation. We have never yet seen the inflammation persist after the fibroid disappeared or become acute after the roentgen treatment in any of our cases.

We have not had the opportunity of treating many cases of streptococcic involvement of the pelvic organs following puerperal infection or abortion, practically all of our cases being of the gonorrheal and tuberculous types. The streptococcic type is undoubtedly more resistant and it is probably in this type alone that extensive surgery is indicated.

Curtis (4), in a recent article, claims that gonorrheal salpingitis is essentially a self-limited process; that persistently active gonorrhea of the tubes is ascribable to recurrent infection rather than to chronic infection, and that, with reinfection prevented, the tubes should heal spontaneously. Curtis never operates in acute cases and has almost entirely discontinued operations for the purpose of the eradication of tubal infections. He has operated on only 15 per cent of his cases, the indication in these being the relief of the sequelæ of salpingitis. It would seem from the above observations that possibly even the radiation treatment would be unnecessary, as the gonorrheal involvement tends to disappear spontaneously. However, the radiation certainly causes the improvement to appear more quickly and may abort the infection before the involvement of the pelvis becomes extensive.

The conservative nature of the radiation treatment permits its use in cases of pelvic inflammation regardless of whatever other treatment is under consideration. The treatments do not interfere with later surgical treatment, if this should be necessary. The small amounts of radiation required can not produce any damage to the patient, and it is not necessary to interfere with menstruation or fertility.

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DISCUSSION

DR. JAMES T. CASE (Battle Creek, Mich.): I would like to ask the speaker if he knows of any case in literature where radiation has been used in treatment of a pelvic disorder of a woman and where pregnancy has occurred thereafter, whether or not this pregnancy has been normal or terminated in miscarriage or monstrosity? Dr. Leroy Burton, former President of the University of Michigan, a well-known biologist, has raised again the question which has been studied by biologists for some time, claiming that any treatment in the way of radiation given to certain classes of animals produces in the second and third generations definite abnormalities which are due to the radiation. Incidentally, he seems to urge that acquired characteristics may be transmitted. Dr. Burton is quite insistent in his warning that although the children may not show any abnormality, yet the grandchildren are sure to. It seems to me that we should not neglect these warnings and we should make the greatest study we can as to the results in humans that will tend to throw any light on the subject.

There is a possibility of lighting up latent pelvic trouble by the introduction of radium. In a considerable experience of treating fibroids by radium application, we have had two cases where an old latent salpingitis has been reactivated. I have had no experience in the deliberate treatment of these pelvic infections by the X-ray. We have always thought there was some danger in interfering with menstruation in such a case, and also danger of producing an activation of the infection, so thus far we have not used this method and shall not do so until we are convinced it is safe.

DR. I. SETH HIRSCH (New York): Just one word regarding the point raised by Dr. Case as to the possible permanent injury to the reproductive organs through adminis-

tration of small doses of X-ray. There are varied opinions regarding the effects of small and moderate doses, whether used for "stimulation" or for production of temporary sterilization, on future pregnancies. Some state that it is a harmless method except during the term of pregnancy, others are opposed to this therapeutic method on experimental and clinical grounds, and a third group apply such doses but only in well selected cases where the definite and strict indications exist.

On the basis of work that I have been doing for several years on hypofunction of the ovary by small doses of radiation to the ovary, I am convinced that no harmful effects are produced by small doses. In over fifty cases which I have treated for ovarian hypofunction, not only have I benefited over 70 per cent, with a resulting return of menstruation to the normal, but there have been eight pregnancies with the birth of healthy and perfectly normal children. This would tend to indicate that the administration to the ovary of radiation is not only harmless but that the effect is beneficial. The trauma which such small doses produce is not only completely recoverable, but, in the end, stimulative to the general ovarian function.

In one case I radiated the patient, though not willfully, with the dose I usually give for hypofunction of the ovary—during pregnancy. The patient was referred to me by a gynecologist for treatment because she menstruated only every two to three months. Instead of coming to me at once, she presented herself months later with the history of a continued amenorrhea. One month after my treatment she reported there had been no menstruation. Examination then showed a two and a half months' pregnancy. She went to term and gave birth to a perfectly normal child—now two months old and perfectly well.

Anyone reviewing the experiments on animals with radiation is at once impressed

with the fact that results obtained in the animals of the lower orders cannot be transposed and applied to human beings. Unless the dose is such as to definitely injure the ovaries, untoward changes in the present or future generations are not to be expected.

DR. L. A. SMITH (Indianapolis): I would like to ask the essayists if they have made any observations concerning the information given by the immediate local and general reaction following high tension X-ray treatment, considered as an indicator of the presence of a pelvic infection. For instance, in patients with cervical carcinoma, requiring both radium and high tension X-ray but with tenderness about the tubes, we have often been able to determine something of the dangers of intra-uterine radium treatment by giving the X-ray treatment first. If, shortly after X-ray treatment is begun, a well-marked constitutional reaction develops, accompanied by pelvic pain and tenderness, we may feel rather certain that pent-up infection is present and that radium treatment will be dangerous. Possibly this has not been generally observed by others, but it has seemed to us to be of value as an indicator of the hazards in the particular case.

DR. WILLIAM E. COSTLOW (closing): The action of radiation upon inflammation is not definitely understood, but apparently there is not a direct action on the bacteria, though probably an indirect effect upon the leukocytes.

I think Dr. Hirsch has answered very well the question which Dr. Case has brought out. There has never been any definite evidence produced which would indicate that radiation on human beings before conception would produce defects in the immediate offspring or later generations. The experiments which have been performed with animals are very conflicting and of little

value in solving this problem. A study of the effects in humans of radiation, applied both before and after conception, is now being made by the Gynecological Department of the University of Pennsylvania.¹ The report of this study will give us some definite information upon the subject.

Personally, we have observed two perfectly normal children born of mothers who had received considerable pelvic radiation before conception.

The technic is given in the paper, but an important point is that very small doses should be used. If possible, try to perfect a standard small dosage, because we know that in treating superficial infections we get our best results if we use very small doses

rather than heavy doses. The same applies to the pelvic infections.

DR. A. W. CRANE (Kalamazoo, Mich.): I think it is an important point to know where we stand on this question of causing an abnormality to future generations by radiation to the pelvic regions. It has not been claimed, as I understand it, that such abnormalities always result to the first generation, but that they come to the second or third. We can not be too sure on this point, and I think it a fertile field for valuable research.

DR. COSTLOW: To repeat what I have already said—at the present time there is no proof that radiation of the human subject before conception will produce defects in the immediate offspring or later generations.

¹Since the reading of this paper, Dr. Douglas Murphy has reported that the study at the University of Pennsylvania so far (in 625 cases) has shown that pre-conception radiation has not been followed by a greater frequency of deformity than normally occurs.

THE NATURE OF ARTHRITIS, WITH CONSIDERATION OF THE *RATIONALE* UNDERLYING SOME FORMS OF PHYSIOTHERAPY USEFUL IN THIS DISEASE¹

By RALPH PEMBERTON, M.D., PHILADELPHIA

ARTHRITIS and rheumatoid conditions constitute the oldest disease entity of which there is any record. These and kindred afflictions were a cause of suffering among the dinosaurs of the Cretaceous Period long antedating the advent of man. Notwithstanding its antiquity, arthritis has been for generations relegated to the unprofitable and, hence, uninteresting chapters of medicine. Interest in it, however, is now undergoing a sharp exacerbation, due, first, to increasing information bearing upon the disease, and, second, to recognition, on the part of physicians and the public, albeit tardy, that it constitutes one of the really great scourges of society. Because of its refractory nature arthritis became one of the objectives of some leading forms of physiotherapy, as well as a chief *raison d'être* for their existence. With certain important phases of physiotherapy the members of this Society are intimately concerned. It is, perhaps, relevant, therefore, to consider briefly the dynamic pathology of arthritis, as we are beginning to understand it, especially in the light cast by a study of the influence of certain forms of physiotherapy on this disease.

Relatively slight progress was made in the treatment of arthritis until recognition of the importance of focal infection as a cause of this and many other diseases. The development of this conception was properly hailed with acclaim and hope was inspired that a full solution of the disease would presently be forthcoming.

It is, however, increasingly clear to dis-

passionate clinicians, and especially to close students of arthritis, that infection constitutes only part of the problem, in respect to either pathology or treatment. According the fullest value to the important advances made through recognition of the rôle of bacterial infection in arthritis, the writer and his associates have been for some years interested in endeavoring to ascertain how focal infection and other precipitating factors act. Knowledge to this end would contribute materially toward an understanding of the disease, because it is clear that the rôle of bacteria in arthritis must be radically different from that which we are accustomed to associate with bacteriologic infections in general, from the standpoint of pathologic histology.

While a full picture of the pathologic processes involved in arthritis is by no means available, light has been shed upon at least some phases. Putting aside, for lack of time, discussion of the various bacterial organisms often productive of the disease and the sites from which they operate, there have been observed in arthritis at large the following points:

1. A fifth of all cases, especially atrophic in type, show a slight decrease in basal metabolism. The metabolism of nitrogen, fats, calcium, phosphorus, and uric acid seems to be normal so far as the fasting blood is concerned. There is, however, a delayed removal from the blood of ingested glucose, which closely parallels arthritis and focal infection. With removal of a causative focal infection and cure of the arthritis, the delayed removal of sugar returns to normal. This observation has led

¹Read before the Thirteenth Annual Meeting of the Radiological Society of North America at New Orleans, Nov. 28-Dec. 2, 1927.

to a series of studies which have shown that, coincidentally with the delay in the removal of glucose, there tends to be, in the same blood, a delay in the utilization of oxygen also, at least in the smaller vessels. This latter delay is apparently not due to any chemical aberration but rather to a change in the circulation which denies, to some tissues at least, their usual quota of blood. It has been possible, indeed, to induce experimentally the delayed removal of glucose seen in arthritis, by interference with the circulation of three limbs. The net result of these observations by Dr. Cajori, Miss Crouter, and myself, which can be only briefly referred to, is to suggest strongly that there exists in arthritis and the rheumatoid state a tendency towards vaso-constriction, or some similar change in the finer vessels, inducing a sort of anemia in some structures. This is best illustrated in the muscles and, interestingly enough, can be in some part negated by the use of vaso-dilator drugs, both clinically and from the experimental standpoint.

If there be, then, a change in the finer peripheral circulation of this order, it should show itself in other ways. This has, indeed, been demonstrated through the collaboration of my associate, Dr. E. G. Peirce, who has observed in a long series of controlled studies that the blood first issuing from a small finger puncture in arthritis contains fewer red cells than does the subsequently issuing blood; whereas in normal persons the opposite tends to be the case. This can be best explained at present on the basis of closed capillary areas and is further supported by some observations by Dr. Cajori, Dr. Peirce, and myself, of which I desire now to make preliminary mention.

A study of the capillaries of the arthritic by means of Lombard's method of direct microscopic observation shows that these contain on the whole less blood than is the

case with normals, and that they tend to show a more sluggish, interrupted stream. Other collateral evidence could be adduced to the same end, but, in fine, it is reasonably clear that a disturbance of circulation, probably in the nature of vaso-constriction, constitutes at least part of the underlying pathology in the rheumatoid and arthritic state. Corroboratory evidence of this conclusion has recently been forthcoming in the work of Dr. Goldhaft and myself on ligation of the patellar vessels of dogs. In agreement with Wollenberg, who first carried out this experiment, we have observed that hypertrophic arthritic manifestations arise when the blood supply is thus interfered with.

Turning now to the latter part of our subject, it has long been known that exercise, massage, and heat in their various forms have been among the measures most useful to the rheumatoid syndrome, though not to be depended on alone. The laity have ascertained these facts for themselves and have made use of them on a large scale, even though the profession by no means fully understands their value. These agencies constitute the historic basis from which other forms of physiotherapy have later arisen and the *rationale* of their influence is now obviously suggested. The suspicion has long existed that the benefit from the above-mentioned measures in arthritis depends upon their influence on the circulation. This was suggested chiefly by the obvious calor and rubor induced in the parts treated. No specific evidence has until recently been advanced, however, that such an influence is in fact desirable from the pathologic standpoint; nor has it been shown in any final way that the influence of these measures has been in this direction. With the aim of ascertaining more of the nature of the influence exerted by massage, exercise, and heat on the rheumatoid syndrome, and hence something of the pathologic proc-

esses involved in this disease, the writer and his associates have carried out biochemical and physiologic studies on the effects of these measures.

Without going into details, which lack of time precludes, it can be said in brief that exercise has been shown by Barr to induce a systemic acidosis which may last as much as an hour after even relatively mild effort. Cajori, Crouter, and the writer, on the other hand, have shown that heat systemically applied leads to an alkalosis induced by the loss from the body of acid substances, chiefly carbonic acid, and chiefly from over-ventilation of the lungs. In view of the value of these measures to rheumatism and the diametrically opposite results they induce from the chemical standpoint, it became of interest to determine the effect of massage, which is of comparable value therapeutically. Massage obviously partakes somewhat of the nature of exercise and it might be supposed that its influence would be in the same direction, but even after the most vigorous application, within therapeutic limits, no such influence upon the acid base equilibrium could be observed as either heat or exercise induces. On the other hand, certain effects are to be observed upon the circulation, common to each of these measures, and it seemed likely that there might be some common denominator between them to explain their influence. This is, indeed, to be found in the increased circulatory rate, shown by a sharp rise in the oxygen percentage saturation of the peripheral blood, following both exercise and external heat. These measures also induce an increase in the red cell count. The influence of massage toward increasing the circulation is not so evident, but it does, nevertheless, have a very marked effect upon the red cell count. It was shown by Mitchell as long ago as the '90's that massage induced a sharp rise of this nature even in anemia, where, indeed, its influence was greatest.

Incidentally, the therapeutic value of this last-mentioned truth is far from appreciated in internal medicine at large.

It thus appears that, from the standpoint of precise laboratory observations, the only explanation which can now be afforded of the undoubted influence of massage, exercise, and heat on the rheumatoid syndrome, is their influence upon the peripheral circulation. It may be mentioned that the reversal of the normal red cell count observed at the periphery in arthritis can be graphically changed to normal as the result of active exercise. These observations on the pathology of arthritis and upon the nature of the influence of some of the most important measures available in this disease are, therefore, obviously reciprocal and constitute a strong argument for the dependability of the viewpoint reached.

Studies of the above nature, upon the influence of physiotherapeutic procedures at large, have, fortunately, another value. This is to afford greater justification for their use and also to establish limits to their therapeutic employment. Thus the fact that exposure of the body to external heat induces an alkalosis, which may result in tetany if pushed, affords one explanation of the detriment consequent upon abuse of this measure. Physicians have long been skeptical of the value of many legitimate physiotherapeutic measures relegated largely to the hands of untrained persons and enthusiasts. A vicious circle has, therefore, been induced, but the newer data on the *rationale* of action of some phases of physiotherapy should go far toward establishing their influence and value. The activities of the newly formed Council on Physical Therapy of the American Medical Association constitute a graphic expression of the awakened interest in this important field. It is almost inconceivable that medical men should have so long neglected measures which are, at

last analysis, among the most fundamental and available we have for the treatment of disease. Escape from this medieval attitude is partly referable to the emphasis on the physics of physiotherapy which radiologists have demanded in their work. There can be small doubt but that, with awakened appreciation of physiotherapeutic procedures at large, and increasing knowledge of the nature of the influence they exert, interest will be further stimulated in some of

the diseases benefited by such measures. Chief among these is chronic arthritis. Much remains to be investigated in this problem. However, if existing information regarding this disease were disseminated widely throughout the medical profession, and if public sentiment could be awakened to adequate effort in the institutional care of arthritics, society at large could be spared an untold burden of suffering and economic loss.

FRACTURES OF THE FEMUR¹

By W. L. ESTES, M.D., BETHLEHEM, PENNA.

THIS paper will treat the subject of simple fractures of the shaft of the femur in a general manner, laying down the principles applicable to the management of fractures in the several regions of the bone, or divisions ordinarily designated in the study and treatment of fractures of the femur.

Thirteen per cent of all fractures which come to our hospital as the result of industrial establishment, highroad, and railroad accidents, are fractures of the femur: 23 per cent is the ratio in military service. In the United States and Canada, about one-half of these fractures occur in the middle third of the bone, and about one-quarter each in the upper and lower thirds. By far the largest number of fractures occur in men in the age period 25-50 years, the active working period of a man's life.

Over 80 per cent of fractures of the femur in civil life are produced by indirect violence; they are brought about by incoordinate leverage. When a break in the continuity of the largest and strongest bone in the human skeleton occurs, in a healthy person, the bone most essential in the proper support and the progression of a human being, great force must have been exerted. This great force will have caused not only the fracture of the bone itself and rupture of the periosteum, but in most instances will have produced marked injury, sometimes extremely serious injury, to the adjacent soft tissues. These fractures should be regarded, therefore, as serious and usually multiple or complicated injuries. It will be understood, as a matter of course, that the systemic effect of fractures of the femur

will always be severe, sometimes most serious.

ETIOLOGY

This heading is introduced in order to emphasize the fact that certain conditions predispose to fractures of the femur, as to fractures of other bones. For the sake of classification, I will divide the causes of fracture into (A) Predisposing and (B) Determining.

(A) *Predisposing causes* include (1) Senility and (2) Certain diseases, as follows: (a) Osteomalacia; (b) Osteomyelitis; (c) Tuberculosis of the bone; (d) Syphilitic infection of the bone; (e) The condition called "fragilitas osseum"; (f) Neoplasms.

(B) *Determining causes* include violence (a) of a direct nature, and (b) of an indirect nature.

The possibility of the existence of a predisposing cause must as a rule be considered in treating every case of fracture, because delayed union or non-union may result on account of the general systemic or local diseased condition, even when good reposition and retention of the fragments have been obtained. However, one need only mention the predisposing causes with this statement and pass on to (B) the *Determining cause*, namely, *violence*—of a direct or indirect nature.

In civil life direct violence, that is to say, force applied directly to the bone in an overpowering degree, is comparatively rare. My statistics show that only 15 per cent of fractures are caused by direct violence, and when they happen, compound fractures usually result, just as they do in military practice.

Indirect violence causes 85 per cent of fractures in civil life, the fracture being

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produced by incoördinate leverage. When a human being walks he progresses by the coördinate action of the muscles on the bones, as levers in regular and ordinary positions. Let the individual be surprised or suddenly thrown or pushed into an unnatural position or posture, and the bones will still act as levers, but in abnormal positions; the muscles will act in an incoördinate, irregular, and violent manner, and a fracture of the bone chiefly concerned may follow.

DIAGNOSIS OF FRACTURE OF THE FEMUR

If one bears in mind the general and local symptoms and signs enumerated above, it is usually easy to determine the existence of a fracture of the femur. When there are found in an individual case with the history of an accident or injury, (1) Everted foot, (2) Distorted thigh, (3) Local swelling of the thigh and discoloration of the skin, (4) Great local tenderness, (5) Shortening of the extremity, (6) Mobility in the continu-

Pathological results of fracture of the femur	(a) Constant, <i>viz.</i> , always present	<ol style="list-style-type: none"> 1. Rupture of the bony tissues including blood vessels, and nerves of the bone, and medulla. 2. Rupture or laceration of the periosteum. 3. Muscular spasm.
	(b) Not always present but usual in all but incomplete fractures	<ol style="list-style-type: none"> 1. Laceration of the contiguous muscles. 2. Effusion of blood.
	(c) Sometimes present	<ol style="list-style-type: none"> 1. Laceration of large blood vessels (hematoma). 2. Laceration or severance of nerve trunks (paresis or paralysis).

SYMPTOMS AND SIGNS OF FRACTURE OF THE FEMUR

(a) General systemic	<ol style="list-style-type: none"> 1. Shock 2. Pain, usually severe 3. Helplessness
(b) Local	<ol style="list-style-type: none"> 1. Distortion of the extremity 2. Swelling and discoloration (ecchymosis) 3. Shortening of the extremity 4. Local tenderness 5. Abnormal mobility, <i>viz.</i>, mobility in the continuity of the bone 6. Crepitus

ity of the bone, (7) Crepitus, one may safely conclude there is a fracture of the femur.

Nowadays it is quite important to have a graphic record and confirmation of the diagnosis by a properly taken roentgenogram; this clinches the diagnosis. At the present time internes in hospitals rarely take time to make a careful physical examination to determine the existence of a fracture. The patient is sent almost immediately to the X-ray room and a roentgenogram is taken. These surgeons-in-the-making thus deprive themselves of the habit of careful clinical observation and examination and learn to depend chiefly on laboratory findings for the data for their diagnostic conclusions.

A fracture of the femur is usually so obvious that it should rarely be necessary to try to obtain motion of the separate fragments, or to obtain crepitus, as these maneuvers cause great pain and are apt to increase the muscular spasm. In some cases where the fracture is near a joint it is, however, not at all easy to diagnose the condition accurately, and after exhausting the methods of a thorough clinical examination, one must depend upon the roentgen ray for clearing the diagnosis.

TREATMENT OF FRACTURES OF THE FEMUR

As was stated before, fractures of the femur are always serious injuries; sometimes very serious. They are, therefore, followed immediately by more or less shock. The general systemic condition must always be evaluated and treated before anything is done for the correction or even the careful examination of the local condition. As a rule, severe pain will be the predominant symptom. One should rapidly examine the condition of the limb at the seat of fracture to ascertain, if practicable, whether a fragment is so displaced that it presses directly

on a nerve, blood vessels, or the skin, and, if necessary, so change the position of the foot and leg that the hurtful pressure shall be relieved. Then a full dose of morphia should be given hypodermically. If heart and respiratory stimulants are indicated, they also should be given hypodermically, but never into the affected limb, for fear of possible infection.

I take every opportunity to reiterate the oft-repeated doctrine that in every case *it is the individual one must treat*. No two patients react in exactly the same way, nor are any two fractures of the femur exactly alike. One must carefully examine the patient as to physical condition, age, evidence of disease or former injury, congenital or acquired previous distortion or lack of development as compared with the other lower extremity.

The average individual of the same age, type, and social position must be considered.

I shall not go into "first aid" further than to say that it is not necessary and it is highly reprehensible to attempt a "setting of the fracture" when one has no proper apparatus or splint to retain the fragments in place. Immobilize the limb in the position of distortion unless there should be at hand the generally applicable and most useful Thomas splint. This may be put on and the limb straightened, held firmly in extension, while the patient is transported to a hospital or to a proper place for a permanent dressing. Unless the patient be a rich or very well-to-do person he should be sent to a well equipped hospital for treatment.

When the patient is seen at the hospital the surgeon should carefully and rapidly determine the general condition of the patient. Having attended to the systemic indications he should then carefully and gently examine the injured thigh. As was said before, unless the fracture be near the hip or knee joint it will be easy to diagnose a fracture of the femur. Any movement of

the ends of the fragments will cause severe pain and this in turn provokes greater spasm of the muscles. Care should be exercised in all manipulations and palpations to move the fragments very little or not at all.

In a case of a muscular or fat thigh it is difficult and painful to determine the relative position of the fragments accurately. Therefore, after finding out that there is a fracture, it is well to fix the extremity by a temporary splint and send the patient to the X-ray room, or have portable X-ray apparatus brought to the patient, and have two roentgenograms taken. As a rule these should be taken in directly opposite directions and with the tube so placed that the rays will pass perpendicularly through the fracture area. The operator may gain further information by using a fluoroscope and seeing the exact position of the fragments.

When the fracture is fully understood, as regards the region of the bone affected, the displacements of the fragments and their relative positions, as well as the condition of injury of the soft tissues, the surgeon should decide at once, if possible, what method of treatment will be best for the individual patient.

The best modern practice employs two general methods:

(1) Immediate adjustment of the fragments and the application of an apparatus, splint, or some fixation means which will retain the ends of the fractured bone in proper adjustment and preserve the correct alignment of the bone and extremity.

(2) Delayed and gradual adjustment by means of suspension traction methods.

The old horizontal traction method by Buck's extension, or some modification of Buck's extension by weight and adhesive plaster on the skin of the patient, is discarded by the more advanced surgeons.

(1) IMMEDIATE ADJUSTMENT METHODS

The first or *immediate adjustment method* may include (a) closed or non-operative procedures, (b) open or operative procedures.

General anesthesia will be required in using the immediate adjustment methods, and an efficient traction apparatus such as a Hawley fracture table or a Lemon or Lambotte extension apparatus. Also a fluoroscope is much to be desired. Always the fixation splint or apparatus must have been selected beforehand and be in readiness before the anesthesia is begun.

Again, let me warn young surgeons that there is no known splint or apparatus which is applicable to all fractures of the femur. The fixation apparatus must be adapted to the individual case. The experienced surgeon with a little mechanical skill will be able to devise or modify an apparatus to fit his case. The tyro will use somebody's splint or apparatus, because it has been recommended for fractures of the femur in the region which the case in question happens to present. *He fits the fracture to the splint or apparatus.*

It should always be borne in mind that text-book statements are at best average statements, more especially as regards fractures. They, as a rule, try to note what the ordinary displacements, signs, and indications of a particular fracture should be. Usually these statements are based on anatomic and mechanical considerations entirely: the physiologic and pathologic forces are not usually recognized or regarded. For instance, fractures of the upper third of the shaft of the femur are followed by upward and outward displacement of the upper fragment, and upward and inward displacement of the lower fragment, according to the books, and anatomically it should be so. As a matter of fact, I have seen almost the reverse conditions.

Displacements and distortion in every case will depend upon the extent and severity of the injury to the contiguous soft tissues. A muscle which ordinarily should produce a certain special deviation of the fragments may be almost or completely paralyzed by the severity of the injury, and another muscle which ordinarily cannot successfully oppose it may be stimulated to tetanic spasm and by extraordinary violence produce an entirely different or widely varying distortion and displacement from that the books and ordinary experience have taught us to expect.

Again, most of the innervating nerves may be severed, or the main nerve trunk be almost crushed by the leverage and weight of the fractured long bone. Paresis of the muscles may follow; gravity and leverage alone will determine the displacement. Congenital or acquired previous distortions also influence displacements. Therefore, a safe postulate for handling and treating any case of fracture of the femur is *never take anything for granted: determine each individual case accurately and carefully and treat it according to its individual requirements.*

Most fractures of the shaft of the femur are transverse or bluntly oblique. This, I think, is an important feature to bear in mind, because when two fragments which have been made by a transverse or bluntly oblique section are replaced end-to-end they require no further traction or extension to keep them in place; just the reverse, indeed. They should be jammed together and fixed by some well-fitting apparatus while the patient is still in anesthesia.

I must confess to a preference for a plaster of Paris cast in most of these cases of transverse fracture in the middle and lower third of the femur, put on very carefully and well moulded about the perineum, knee and ankle joints, so that there shall be no slipping when the patient has come out

from the anesthesia, and when the plaster shall have dried. In order to lighten the cast I have been accustomed to use over the fracture region strips of elastic fibrous wood worked into the cast and so placed that they shall act as apposition splints, as recommended long ago by Hamilton.

After the plaster has quite dried the extremity is suspended to an overhead frame similar to the Balkan longitudinal overhead beam. The suspension may be made by working into the anterior surface of the cast a wire netting to which hooks are attached, or it may equally well be accomplished by broad bandages passed under the cast at three regions, namely, the ankle, the knee, and the middle thigh. This suspension method I have used in selected cases since 1886 and have found it efficient and comfortable for the patient, as well as for the nurse in the management of the patient.

Thomas' splint is another efficient apparatus for use in transverse and bluntly oblique fractures of the middle and lower third of the thigh. The adjustment of the fragments should be accomplished by visual direction obtained by means of a fluoroscope. While a Hawley, Lemon, or Lambotte traction apparatus extends the limb, the surgeon should carefully manipulate the ends of the fragments into place. When the fragments have been brought end-to-end, the traction should be discontinued, and while the apparatus holds the limb in the proper horizontal plane, the distal fragment should be pushed upwards against the proximal one. This to a degree fixes the fragments. While the position is carefully maintained the splint or cast should be applied.

After the fixation apparatus has been applied, the position of the fragments should be verified under the fluoroscope. After twenty-four hours a roentgenogram should be taken. If the fragments have become displaced, the fixation apparatus should be readjusted or removed, and another setting

made. If a second time, after twenty-four hours, displacement of the fragments has occurred, another method of fixation or some traction method should be employed.

I have employed the open method in the management of these obstinate cases, when two attempts at reduction and retention of the fragments have been unsuccessful. I believe that, in the hands of an experienced surgeon, who is well equipped and a good aseptician, it is justified. I use a plate devised by myself applied directly to the bone. The plate is made of Wessel silver, the fixation pegs are shouldered and the upper ends flattened, and the external or upper ends are long enough to project through the skin. They thus act as a drainage medium and may easily be removed, without reopening the wound. They are always removed, though the plate may remain in place, if thought best.

While it is always desirable, it is not absolutely necessary for a good result, to have the ends of the fragments in exact apposition throughout the fragmented surfaces. If as much as one-quarter of the proximal or distal end impinges firmly upon or against the other, the alignment may be preserved and the result will be good. If, however, the ends continue to overlap, the alignment cannot be good; there will be shortening, and functional recovery will be slow. A readjustment of the pelvis will be necessary afterward and the patient must change his gait.

SUSPENSION TRACTION METHOD

The suspension traction method should be used for fractures of the upper third of the femur and for very oblique or spiral fractures lower down in the shaft.

The Russell frame appears to me to be the simplest and apparently the most efficient of the so-called Balkan frames.

Sufficient weight should be used to draw the distal fragment to its proper place. Fre-

quent and skillful adjustment is necessary whenever a Balkan frame and the suspension traction method is used. In civil hospitals, where the internes are usually recent graduates, and have had no training in the use of the method, the attending surgeon is handicapped and will have results much less satisfactory than those attained in military hospitals which have experienced and well trained medical officers to carry out the readjustments.

Besides, it is almost necessary to have a portable X-ray outfit in order to make the fluoroscopic or roentgenographic examinations required to ascertain from day to day whether the fragments are adjusted and whether the adjustment continues satisfactory. The suspension traction method, however, offers two great advantages over the external or internal splint fixation methods: (a) Motion of the knee and ankle joints may be made and (b) early massage may be employed. Frequently, too, the traction may be employed above the knee in the suspension traction method, and thus relieve the knee joint of the strain of the long-continued pull the old traction methods required. So important do many surgeons consider this freedom of the knee joint that they recommend the use of tongs or a Steinmann nail attached or passed through the condyles of the femur for the traction attachment. Undoubtedly this secures much more reliable traction, as it is attached directly to the distal end of the lower fragment and less weight is necessary for the extension.

Occasionally fractures of the femur are of such a kind, or the conditions are such, that they require the open method from the very beginning for their treatment. Such are fractures which are accompanied by considerable laceration of the muscles and fascia and which cannot be reduced because the ends of the fragments are entangled in the lacerated soft tissues. Also, I think, cases in

which a good-sized artery has been torn across, indicated by the rapid development of a large hematoma, should be operated upon.

I shall not go into a full discussion of the merits and advantages and disadvantages of the non-operative and operative methods for fractures of the femur. I find that I have used the open method in 38 per cent of my cases, and, having obtained good results in these cases, I would not hesitate to use it in any case which had resisted my efforts to obtain good apposition under anesthesia, traction on the Hawley fracture table, and manipulation, or which could not or would not be extended and adjusted by the suspension traction method, if the patient's general condition did not contra-indicate it. The open method should not be delayed longer than ten days after the fracture has occurred. It should be employed only in a well equipped hospital, however.

Whichever method of treatment may be employed for readjustment and fixation of the fragments, passive movements of knee and ankle joints should be begun, not later than three weeks, and, when practicable, massage should also be employed. Many of the evils which develop during and after the treatment of fractures are due to too persistently long retention of the limb in tightly fitting apparatus, and traction on the knee joint without the relief of flexion and the stimulation and regulation of the blood supply by massage. Eight weeks is the average time required by fractures of the femur for the employment of fixed apparatus or persistent traction. After this period, as a rule, the patient may be allowed to be out of bed with some light apparatus on, such as a light moulded plaster of Paris splint, a light Thomas splint, or a brace similar to the old Hutchinson hip joint brace. The patient must not be allowed to bear weight on the affected limb, however. He should use crutches for six or eight weeks longer.

The average time required in the hospital is ten weeks.

VICIOUS, DELAYED UNION, AND NON-UNION

Vicious union undoubtedly is due in most instances to lack of proper adjustment and retention of the fragments of the fractured bone. This may not always be the fault or due to lack of skill on the part of the surgeon, though it generally does result from this cause. In a few cases it may result from the nature and condition of the fracture itself and the physical condition of the patient; for instance, in cases of badly comminuted fractures where as much as six centimeters of bone are splintered and the patient in such a low condition from shock and other coincident injuries that an open operation, or, indeed, any operation, would not be tolerated. It may also result from impossibility of control of the patient in cases of delirium, either from alcoholism or from other causes.

While *delayed union* and *non-union* result in most instances from improper or faulty adjustment and retention of the fracture, as was said before, these conditions may be brought about by too tightly fitting bandages or apparatus, lack of change of position, lack of massage, and lack of passive movements of the joints of the limb.

If it were necessary to have further evidence than the observation and experience one has from the treatment of fractures of the clavicle and lower maxilla, that absolute immobility of the fragments is not necessary for the prompt and firm union of fractured bones, I think the multiplied experience surgeons have obtained in treating fractures by the suspension traction method must convince us all that it is not necessary so to apply splints, casts or any apparatus that no motion should be possible at the seat of fracture. One should apply his fixation apparatus so that the ends of the fragments shall not be separated and shall

not again override, but it is not necessary to attempt to prevent all motion at the seat of fracture.

The interposition of muscle or fascia between the ends of the fragments so that bony surfaces may not come in contact will cause delayed and perhaps non-union. For this reason, as was stated in a preceding paragraph, this is an indication for an open operation at the beginning of the treatment, if it be recognized. It is always a contra-indication for the employment of the suspension traction method of treating the fracture. It may sometimes be obviated by rubbing the ends of the fragments against one another, while the patient is thoroughly relaxed in general anesthesia; in this way the ends may be freed of the investing muscle or fascia. This is another reason why it is best to jam the ends of a transverse or obtusely oblique fracture together when "setting the bone," as was recommended.

Constitutional dyscrasias of various kinds, and, of course, neoplasms of the bone, will produce delayed or non-union. It is very important, therefore, to have careful and systematic examination made of the whole organism of the patient. Full examinations of the blood and urine must be made; especially should the chemistry of the blood be well investigated. If the salts of calcium are deficient in the blood or if there be lack of globulin, measures should at once be employed to remedy the condition so far as possible. Syphilis and tuberculosis, if present, should receive prompt attention.

When delayed or non-union of a fracture occurs from malposition, from faulty adjustment of the fragments, or because the fragments have slipped asunder after they were well adjusted, an open operation as a rule will be necessary. The ends of the fragments will have rounded off, atrophied, and become eburnated. These conditions signify lack of proper blood supply, as the haversian canals and lacunæ will have closed

or been destroyed. It will be necessary to excise the terminal extremities of the fragments, in order to have fairly normal bony surfaces to apply to one another. A fixation plate or some other device applied directly to the bone will be required in these cases. This method will result in shortening the bone considerably, and recovery, as a rule, will be slow, and rehabilitation will require a long period in the hospital.

A better method will be a bony implant taken from some other bone, after the Albee method, or the sliding of a long cylindrical section, cut out of one or the other fragment, across the fracture and the fixation of it in a corresponding groove in the opposite fragment. The former is the better practice in cases of non-union; the latter may be employed in cases of delayed union. Thus are furnished not only grafts of healthy bone, but a means to serve at the same time as local fixation devices for retaining the fragments in place. They must, of course, be fortified by an external splint or apparatus of some kind. As was stated before, I prefer a plaster of Paris cast to splint these cases.

RESULTS OF FRACTURE OF THE FEMUR

If one may take the final report of the Committee on Fractures of the American Surgical Association, made in 1921, as a correct statement of the average result obtained by surgeons of the United States and Canada in the treatment of fractures of the femur, 87 per cent of all cases treated by non-operative methods, of all the regions of the femur, made good functional recoveries. Only 42 per cent had good anatomical results; 42 per cent had moderate anatomical results; 15 per cent had bad anatomical results; 4.9 per cent died.

It is evident, therefore, that good functional results occur in cases which are not good anatomical recoveries, but good ana-

tomical restitution is followed by a shorter period of disability.

Cases treated by the open method (a much smaller number) showed the anatomical results rated as 68 per cent against 42 per cent in the non-operative cases, but the good functional results were 77 per cent as compared with 87 per cent of non-operative cases. As will be shown later the time of disability is about one month longer in the cases operated upon.

Period of Disability.—This is taken to mean the period of time from injury to the time when the patient may return to his former employment, or to other equally active habits.

In the report of the Committee on Fractures of the American Surgical Association, on account of the differing conditions of life, the patients were divided into two classes: (1) Those of the age period under fifteen years. The average disability in this class is 4.5 months. (2) All those over fifteen years of age. The disability is 8 months. The operative cases show an average disability of 9 months.

In a recent report compiled by Dr. J. B. Walker, of New York City, the Consultant on Fractures of the U. S. Veterans Bureau, the period of disability of fractures of the femur in the World War is stated as follows:

"Of the 5,138 cases, 259, or 5 per cent, required a period of 2 years to reach a stationary level; 435, or 9 per cent, required 3 years; 637, or 12 per cent, required 4 years; 1,185, or 23 per cent, required 5 years, and 2,622, or 51 per cent, required more than 5 years. Thus, 26 per cent of the changes in rating occurred before the end of the fourth year, so that 74 per cent of the femurs required more than 4 years to reach a stationary level."

One must bear in mind that at least half of these military cases were compound fractures and badly infected. Dr. Walker states (page 2 of his report) that for each

simple fracture of the femur not received in battle, the average time lost was 184.4 days. The military rating recognizes a "stationary period" of disability, which means the period beyond which no further improvement in function may be expected. In cases of fracture of the femur six years is the limit.

Through the courtesy of Dr. Shoudy, Chief Surgeon for the Bethlehem Steel Corporation, I have been able to follow up and keep in touch with many of the cases of fracture we have treated in St. Luke's Hospital. The research has shown conclusively that there is in civil practice also progressive improvement in the disability of cases of fracture. Cases rated at 25 per cent disability after the so-called average period of disability we find disappear entirely in two years, and those with higher rating greatly improve. I think we have pretty well established the stationary period for fractures of the femur in civil life to be three years. This is an important point for insurance companies and for compensation boards.

RECONSTRUCTION METHODS AFTER FRACTURES OF THE FEMUR

A surgeon should not consider his treatment completed, nor should he relinquish direction of a case of fracture, until the patient is restored to the fullest possible function. After every fracture it will be necessary to employ some physiotherapy. In fractures of the femur, except perhaps in cases of children, these physiotherapeutic measures should begin as soon as the condition of the patient and the local reconstruction of the bone will permit. As was stated before, passive motion of the knee and ankle joints may as a rule be made after three weeks of confinement or traction. Massage, too, is very useful in preventing passive congestion and stiffening of muscles and joints; this may be begun at the same time passive movements are instituted. One

great advantage of the suspension traction method is the facility it offers for flexion of the knee joint and early massage. By the older methods of traction and by confinement in casts or splints stiffening of the knee joint will inevitably occur and there may be a little atrophy of the muscles. These conditions must always receive serious and careful treatment for complete restoration of the patient's future usefulness. We have found, besides assisted movements and massage, diathermy to be very useful. Diathermy also seems to be of great service in cases of delayed union, combined with heliotherapy, fresh air, calcium salts internally, and massage. Physiotherapy should be given by a trained individual, be gradual and graduated, and always under the direction of the surgeon.

A patient may come through the ordinary period of treatment for fracture of the femur with apparent good union and the fragments well apposed, and the limb in good alignment, but after being allowed to be up and about a bow at the seat of union may occur and the good alignment of the limb may be destroyed. This follows too early weight-bearing on the extremity. Some form of caliper or brace should be used after fractures of the femur to prevent this hurtful pressure, before firm union at the seat of fracture has been established. The length of time the caliper should be used will depend upon each individual case, but

an average of one month will be about the necessary period the brace should be employed.

Laymen are rarely qualified to understand and properly to construe a roentgenogram showing the position of the fragments after union has occurred in a fracture case if the fragments deviate from the end-to-end position. While it is very important to obtain a roentgenogram after union has occurred, to serve as a record, it should be shown to the patient and his friends by the surgeon, if it is shown at all, and explanations be given and prognosis offered to reassure them of the future appearance and usefulness of the limb. Cases of apparent overlapping of fragments and of what seems to be considerable local distortion will, after two years, round off and be so reconstructed that very little local distortion will be apparent and no lack of function be present. More than two centimeters shortening after a fracture of a femur has united always means loss of bone or overlapping of the fragments. Unless good alignment has been obtained—and this is problematic in such cases—reconstructive measures short of resection will rarely obtain full function except in a young subject. In youth, the pelvis and joints of the extremity may be readjusted, so that very little, if any, loss of function will be noticed either by the patient or by an observer.

CASE MANAGEMENT IN RADIOTHERAPY¹

By MARGARET HOING, CHICAGO

IN previous years many a radiologist did all of his own work—diagnosis, radiography, laboratory tests, treatment, etc. No doubt, he had to answer the telephone and be his own assistant as well. To-day, with the rapid advancement in radiology, the demands made upon the radiologist are so great that frequently he is too busy to manipulate the control switch for giving radiotherapy. For this reason the radiological technician can be of great assistance. By being sufficiently qualified, she can assist him in carrying out his work, following the order or prescription as written and signed by him.

There are many things to be considered in caring for a patient receiving radiotherapy, but before going into those details, it is well to first state the requirements necessary to enable one to manage cases receiving treatment.

First: A registered technician, preferably a graduate nurse, from a first class training school.

Second: Two years of work under the direction of a qualified radiologist, after which time such a technician may take an examination regarding technic, construction and type of machine used, the answers to the questions being written in the presence of a radiologist appointed as the examiner from the Bureau of Registration.

The examination includes a practical demonstration of technic in making radiographs of different parts of the body, and recording definitely the technic used in the X-ray exposure and development. These records are forwarded to the Bureau, where they are passed upon by the National Committee. If the report of the Committee is favorable, the applicant is permitted to register in the

Bureau and in due time she receives a certificate of registration from the National Committee, the Bureau, and our Association. This certificate deserves to be displayed in the department where it may be conveniently observed by patients and visitors: those who take occasion to read it will understand that the person named is qualified to do the technical work for a radiologist. Frequently reference to it prevents the loss of time that would be required to explain that one has qualified herself thoroughly for the work she is doing. It lends confidence to the patient, as well as to professional persons with whom one comes in contact, particularly in hospitals and other institutions.

Unless one has a daily service man, which most of us have not, it is the duty of the technician to keep the machines and X-ray tubes clean and free from dust. It is important that the technician shall be thoroughly acquainted with the equipment and be able to detect and accurately describe any change indicating trouble that may occur while the equipment is running. Early detection frequently prevents repair jobs, obviates the necessity of temporarily closing down, and saves the expense incurred by securing a service man.

In radiological departments where the equipment is cleaned, oiled, and maintained by skilled mechanics who service it at regular intervals, it is most desirable to have the technician keep closely in touch with the detail of what is done, in order that she may institute such service as may be required in the absence of the mechanic.

Before the patient enters the radiological operating room, see that the equipment is in order. Note that the table presents a neat appearance with fresh linen, etc. Also see that proper ventilation has been provided.

¹Read before the American Association of Radiological Technicians, April, 1928.

It is often necessary to place pillows or sandbags about the patient in order to secure the greatest possible comfort.

At all times it is the technician's duty to endeavor to be professional and ethical. Exercise a true spirit of loyalty at all times, for the physician who has referred the case and the radiologist who is directing the work. There is frequently a tendency on the part of the patient to discuss his doctor, and in many instances he will ask the technician as to the doctor's ability, if he is giving him the proper treatment, or if the technician can direct him to—as he may term it—a “bigger professor.” This is sometimes done slyly to see what the technician will say in reply to the questions. Occasionally patients will ask all manner of questions about their condition, the diagnosis, and treatment. Also, what the ailment of Mrs. A. or Mrs. B. might be. Do not discuss one patient's condition with another. Such a discussion is not uncommonly carried on by patients themselves when two or more are placed in one room in the hospital. It, therefore, behooves the technician, nurse, or operator (ofttimes called “doctor”) to be alert every moment, ready to answer intelligently any question that may arise. It is the part of the technician to help to convince the patient that he is in good hands, receiving the best of care from his physician, referring the questioner to him for answers that are of a medical character.

Many times it is necessary that patients be hospitalized for radiation. Some object to this, owing to the fact that they are able to be up and about, under-estimating the importance of the treatment since it involves no anesthesia or surgery. Resourcefulness in the management of such cases is essential, for each individual case will require something additional or something different, in order that each patient may be thoroughly satisfied with the management and treatment given him in the radiological operating room.

TECHNIC

In radiographic work there are certain factors that must be carried out minutely in order that the radiograph may show pathology, if present. Likewise, it is essential that the details of technic be accurately followed in order to give the proper treatment in the way that the radiologist has prescribed it to be given. The necessity of observing carefully every detail of the technical set-up of the equipment and observing the patient also, cannot be over-estimated. Be sure the kilovolt peak is accurate, determining same by the use of the sphere gap. It is well to occasionally check up the sphere gap to know that it is in good working order, for its mechanism may change and the scale fail to be the true reading between the spheres.

It is advisable that the technician shall know how to manipulate the roentgenometer, the iontoquantimeter, or any dosimeter in use in the department that may aid in determining the intensity of the X-ray beam that is being delivered at any given time, and thereby compute the number of r -units per minute delivered to the patient. Determine the distance correctly by the use of a centimeter rule. See that the portal of entry is properly exposed, leading off the area by means of lead diaphragms placed beneath the tube. In order to prove that there is no leak in the lead diaphragm, make an exposure of a few seconds on a film. Upon developing this, one will know whether he is safe in going ahead with the work. Another method is to use lead rubber for protection from rays from the patient. Do not fail to see that the tube is in proper position, as scattered radiation from the cathode end of the bowl may result seriously. Have the focal spot on the center of the field to be radiated. With all things in readiness thus far, select the filter to be used and place it in position. This done, recheck every move made, in order to be assured that everything is ready for starting the treatment. Give

the patient a signal of some kind, that he may be able to call you in case of necessity. With all settings correct as to order, throw the control switch and start the machine. See that the filament lights up properly and that the milliamperage is correct, as variation means much in the output of the X-ray tube. Use a dependable timer, one that has been tested for accuracy.

It is the duty of the technician to be at the control stand throughout the entire treatment, and to be in such a position that the patient may be observed at all times.

SUMMARY

In conclusion, let me emphasize again the importance of conducting the treatment prescribed with painstaking accuracy in every

detail. Let me call attention to the responsibility carried by every technician in the conduct of radiotherapy. We should at all times be aware of the power for good or harm inherent in X-rays. Our obligation to the patient to administer no harm to him is scarcely more than the obligation to the radiologist who has prescribed the therapy. Be patient, conscientious, and observing in all matters. No matter how long the day may seem nor how difficult the work has been, do not stop until there has been given to each patient the best of care. Record all technic as given and report to the radiological director any noticeable symptom, as nausea, emesis, etc. Also, report any change detected in those areas receiving radiotherapy.

EDITORIAL

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NEGATIVE X-RAY FINDINGS

Negative findings are the bane of roentgenology. To locate a safety-pin in a child's throat is easy, but to prove that no safety-pin has been swallowed necessitates a correct X-ray examination of the entire gastrointestinal and respiratory tracts. A poor film may show a fracture of the hip, but to demonstrate the absence of fracture demands the best films, usually stereoscopic, and of both hips, for comparison. These negative findings require not only the best work, but extra work and material. The roentgenologist knows it, the surgeon knows it, but does the patient know it? His reaction to the bill of expense may answer this question.

The end-results of such cases are definite, yet in a more difficult class of cases the final result may be left indefinite and still less satisfactory to the patient. A cluster of dense gallstones may show on a single film, but in the event of a negative plate, a series of films is required after the administration of the iodophenolphthalein. And then, if no gallstones are demonstrated, the roentgenologist cannot always say "there are no stones," because the gall-bladder shadow may be faint and indecisive notwithstanding the intravenous administration of the dye.

Again, a case of gastric hemorrhage with symptoms of ulcer is sent to the X-ray de-

partment. Sometimes a single series of screen observations and films show a persistent niche on the lesser curvature. The patient may be dismayed by the diagnosis but he will appreciate the skill of the roentgenologist and the wonder of the X-ray. Nevertheless, when no sign of ulcer or cancer is found, and extra series of films are made after extra barium meals, all with the utmost care and skill, then, with the fact of hemorrhage left unexplained, the patient wonders if the roentgenologist knows his business. And occasionally the surgeon, ready to do a delicate and costly operation, also may wonder. We hasten to add, with grateful recollections, that many surgeons stand by the roentgenologist and interpret the findings to the patient with candor and a sympathetic understanding. The fact remains that negative findings place the roentgenologist on the defensive and require more or less explanation.

Blood in the urine is suggestive of stone. If, also, there is a history of pain in the back extending into the groin and genitalia, the clinical diagnosis of stone is convincing to most surgeons. The patient is then sent to the X-ray table, not so much for diagnosis as for the purpose of locating the stone. If, as often happens, no stone is discovered, then negative findings have left the surgeon with a "typical case" shorn of a diagnosis. Later the roentgenologist may hear that the case has been again roentgenographed in another office. This may occur even though the surgeon knows that hematuria is due to stone in only 18 per cent of cases, and that a blood clot, passing the ureter, may cause a renal colic. Furthermore, a stone may have passed or be one of those

rare calculi without requisite opacity. With the young roentgenologist this verification should be welcomed. His reputation is in the making. He will learn that the high-sign of confidence is the acceptance of negative findings.

A qualified diagnosis is the negative phase of positive findings. If, for example, an image, apparently of a stone, is found on the film, then the experienced roentgenologist may refrain from an unqualified statement but advise a cystoscopic examination so that an opaque catheter will show the position of the ureter and stereoscopic pyelograms outline the pelvis and calyces of the kidney before the stone can be definitely localized in the urinary tract and differentiated from calcified mesenteric gland and phleboliths. The triumph of a clear-cut, dogmatic diagnosis of a renal calculus has more than once been changed to humiliation by the failure at operation to find a stone. Especially in the report of a ureteral calculus, has a rash interpretation been the anticlimax of good technical work. Although the qualified diagnosis occasionally may be the resort of the incompetent to cover inability in roentgen interpretation, yet at its best it is an admirable product of judgment and experience.

The most perplexing of negative findings are in those cases of reflex abdominal pain in which the cause lies outside of the abdomen, as in abdominal angina and mucous colitis. Rarer cases may be due to angioneurotic edema, the gastric crisis of tabes, or the milder crises of the erythemas. No less perplexing are the nausea, vomiting, and vertigo of the Ménière syndrome, which bring no inconsiderable number of cases to the roentgenologist for the examination of the gastro-intestinal tract and gall bladder. The skillful roentgenologist may do some of his finest work and from finished screen observations and beautiful plates finally report to the surgeon negative

findings. The surgeon tells the patient that the X-ray showed nothing and the patient tells inquiring friends, contemptuously: "Oh, they found nothing." As for the reputation of the roentgenologist, "They went and told the sexton and the sexton tolled the bell."

Concerning less skillful roentgenologists, or merely hospital technicians, who may, in their zeal to find what is expected of them, misinterpret doubtful findings, we have nothing to say.

The clear statement of negative findings by the competent roentgenologist often requires courage, honesty, and a steady self-confidence. Such negative findings as to pathology could be reported more properly as positive findings regarding normal structure and function. Their value to the patient may be incalculable. Not only may operations be avoided but the internist is thus challenged to study the case anew with greater care and insight.

It is especially in the event of negative findings that the roentgenologist should exercise his rightful function as a consultant. Where a professor of roentgenology meets with his confrères in the morning discussion of cases, this may be recognized, but in the private practice of roentgenology the surgeons or physicians may assume that he should confine himself to the X-ray field. That is to say, while he should have a medical education yet he should be careful not to use it!

But this is not always so. The attending physician may frankly ask the roentgenologist to make a diagnosis, if possible. Under such circumstances, to plan the X-ray examination requires a scrutiny of the case-records. This is the most delightful type of X-ray practice and may demand the exercise of the widest medical knowledge and experience. But it is full of added responsibilities, because, if the course of the X-ray examination decided upon by the roentgen-

ologist yields only negative results, then the justification of the time and expense rests with him. And it is then that the interpretation of negative findings acquires added importance, and the art of narrowing down diagnostic possibilities until the pathologic entity is cornered, is found to be an engrossing game.

The line that divides roentgenology from general diagnosis is an imaginary boundary which vanishes as we approach it. In such work we must ever remember that our base is roentgenology and not be led by negative findings over too wide a field.

But the fact of negative findings is inescapable. They may need nothing more than the simple statement of results or they may need interpretation; but, in either event, surgeons and physicians should appreciate the extra skill and time which are so often required for such reports and should be careful to do the roentgenologist justice in their explanations to patients, bearing in mind that negative findings are the test of excellence.

A. W. CRANE, M.D.

ORGANIZATION OF COURSES IN THE VIENNA FACULTY OF MEDICINE

LIST OF PHYSICIANS' COURSES TO BE GIVEN
IN THE SCHOOL YEAR 1928-29

(OCTOBER 1, 1928, TO SEPTEMBER 30, 1929)

Translation by Henry Riggs Wolcott from "Verzeichnis der Aerztekurse im Studienjahre," 1928-29, published by Minerva, Vienna, 1928

Regulations Concerning Admittance and Attendance

1. Only graduate physicians, pharmacists, and chemists are entitled to register for the Wiener Aerztekurse (Vienna courses for physicians).

2. The Kursbüro (registrar's office) of the Vienna Faculty of Medicine is located

at Schloßelgasse 22, Vienna VIII (opposite the Allgemeines Krankenhaus [general hospital]), Telephone B-45-4-41, and the office hours are: Monday to Friday, 8:30 to 1 P. M., and 2:00 to 5:30 P. M.; Saturday 8:30 A. M. to 2 P. M.

The Kursbüro gives information on all matters pertaining to courses, also in regard to the conditions for participation in the work of the clinics and other therapeutic institutions (Krankenanstalten). In the case of written inquiries, return postage should be enclosed (foreign stamps will be accepted).

3. Registration for courses, whether made in person or by mail, will be at the Kursbüro. Upon paying in person or by mail, the sum of 10 schillings (\$1.50), or an equivalent sum in foreign exchange (remittance by registered letter containing banknotes of the country concerned is acceptable), the registrant will receive a blue registration card termed "Teilnehmerkarte," which is valid for the whole school year, from Oct. 1, 1928, to Sept. 30, 1929, and entitles the registrant to the following privileges:

(a) The issue of a certificate by the dean's office (das Dekanat) of the Faculty of Medicine after at least three months' attendance, which must be confirmed on the registration card (Teilnehmerkarte) by the instructors in the courses taken. Registrants who wish to secure such certificates must present their original doctor's diploma at the office of the dean (das Dekanat).

(b) Price reductions at certain hotels, boarding houses (Pensions), and restaurants (Speiseanstalten). Addresses may be secured at the Kursbüro.

Participants in the International Postgraduate Courses, for the duration of the course concerned, including Austrian physicians, who during the current school year wish to participate in only one course of the Kursbüro, are not required to secure

a registration card (Teilnehmerkarte), but need pay only a fee of 2 schillings, receipt of which will be noted on the tuition fee receipt and the amount will be deducted in case a registration card (Teilnehmerkarte) is procured later.

4. No person will be admitted to the courses without a registration card (Teilnehmerkarte).

Every participant, including those who take part in the International Post-graduate Courses, will receive also from the Kursbüro an orange-colored identification card (Legitimationskarte), issued by the office of the dean of the Faculty of Medicine, which entitles the registrant to cross the Austrian frontier repeatedly, during the whole school year, without a *visé*. (Decree of the Austrian Bundeskanzleramt [office of the Federal Chancellor], line 85.113—8, under date of February 12, 1926.) In addition, only a valid passport is required, which, together with the identification card signed by the owner, must be presented at the Austrian frontier to the officers in charge. Members of the family of an owner of this identification card, provided they are travelling in his company and are in possession of a family passport covering such members, are likewise exempted from procuring an Austrian *visé*. (Decree of the Austrian Bundeskanzleramt, line 173, 716-8, under date of December 6, 1926.) This privilege is not accorded to Russian and Ukrainian citizens, nor to persons who hold no state allegiance; for these, special regulations are in force.

5. The Kursbüro will register applicants for the courses announced in the following list and will inform participants as to the exact time of the beginning of the courses. Special attention is called to the fact that the Kursbüro cannot guarantee that any particular course desired will actually be given, since that will usually depend on whether there is a sufficient number of ap-

plicants for the course. For similar reasons, the day and the hour of the beginning of the course will not be announced until the necessary number of applications has been received.

6. At the Kursbüro there is a department for students' mail, and all registered students and "*hospitanten*" (persons accorded the privilege of "auditing" the courses) may have their letters and telegrams sent to this department (Poststelle, Kursbüro). The identification card must be presented when inquiring for mail.

7. The official list of "Aerztekurse," or physicians' courses, is furnished without charge.

8. Accommodations in hotels and boarding houses (Pensions) will be secured for registrants, on request (from 5 to 10 per cent price reduction).

9. The Kursbüro of the Vienna Faculty of Medicine has made arrangements with the "Oesterreichisches Verkehrsbüro, Vienna I, Friedrichstrasse 1, whereby the "Verkehrsbüro" has agreed to furnish all persons taking part in the courses any aid or information they may require with reference to trains, routes, and modes of travel. Any inquiries along that line will be transmitted by the Kursbüro to the Verkehrsbüro for direct settlement.

In case there is sufficient demand for a course not announced in this list, the Kursbüro will, on request, arrange, if possible, for such a course.

If there is sufficient demand for courses to be held in the French language (instead of German), the Kursbüro can arrange for such courses.

IX. Roentgenology and Ray Therapy (*Strahlentherapie*) 108. Dozent Albert Fernau, Dr. phil.: The physical bases of radium therapy (or The relation of physics to radium therapy), 6 hours; minimal number of participants 2; maximal 6. Per hour for all participants taken collectively.

30 schillings. Radium Station of the Klinik für Dermatologie und Syphilidologie, Allgemeines Krankenhaus, III Court. After mutual arrangement.

74. "Assistent" Dr. Otto Fliegel: Orthopedic Roentgenology. 10 hours; minimal number of participants 4; maximal 6. Sixty schillings. University Ambulatorium for orthopedic surgery, Allgemeines Krankenhaus, IX Court. October, 1928, to June, 1929. Daily (afternoons), after mutual arrangement.

20. Dozent Dr. Ernst Freund: Physical Therapy in its Application to Internal Diseases, 20 hours; minimal number of participants 10; maximal 20. Sixty schillings. I. Medizinische Klinik, Hydrotherapie, IX, Lazarettgasse 14. November, 1928, to May, 1929. Daily (except Saturday), from 9 to 10 or from 11 to 12 (forenoon).

141. Prof. Dr. Leopold Freund: I, Roentgenotherapy for Dermatologists, Pediatricians, and Practising Physicians; II, Roentgenologic Diagnosis for Pediatricians. Each, ten hours. Minimal number of participants, each course, 6; maximal, each course, 8. Per hour for all participants taken collectively, each course, 35 schillings. Karolinen-Kinderspital, IX, Sobieskigasse 31. Every month, on all week days, from 6:00 to 7:00 P. M.

109. Dozent Dr. Herbert Fuhs: I, Light Treatment in its Application to Skin Diseases. Three hours. Minimal number of participants 5; maximal 10. Eighteen schillings. II, Diathermy as Applied to Skin Diseases. Three hours. Minimal number of participants 5; maximal 10. Eighteen schillings. III, Roentgenologic Treatment of Skin Affections. Five hours. Minimal number of participants 5; maximal 10. Thirty schillings. Light station of the Klinik für Dermatologie und Syphilidologie, Allgemeines Krankenhaus, II Court.

October, 1928, to July, 1929. Daily (except Saturday), from 5 to 6 P. M.

142. Prof. Dr. Walter Hausmann: Biologic and Physical Bases of Light Therapy (Exclusive of Roentgen Rays). Minimal number of participants 6. Ten hours. Foreigners, 50 schillings; nationals, 30 schillings. Physiologisches Institut, IX, Schwarzpanierstrasse 17. After mutual arrangement.

78. Dozent Dr. Theodor Hryntschak, in collaboration with Prof. Dr. Martin Haudek (or Doz. Dr. Felix Fleischner): Urologic-roentgenologic Laboratory Course ("Praktikum"). From 6 to 8 hours. Maximal number of participants 6. Per hour, for all participants taken collectively, 30 schillings. Wilhelminenspital, XVI, Montleartstrasse 37. Every month, forenoon, after mutual arrangement.

101a. "Assistent" Dr. Hellmut Kammer: Roentgenologic Diagnosis in Urology. Minimal number of participants 1; maximal 4. Ten hours. Per hour, for all participants taken collectively, 30 schillings. I Frauenklinik, IX, Spitalgasse 23. Every month.

111. "Assistent" Dr. Josef Konrad: I, Diathermy with Practice Work. Three hours. II, Roentgen-ray Therapy as Applied to Skin Diseases, with Practice Work. Five hours. Maximal number of participants 6. I and II, per hour, for all participants taken collectively, 30 schillings. Light station of the Klinik für Syphilidologie und Dermatologie, Allgemeines Krankenhaus, II Court. Every month.

29. Dozent Dr. Alfred Luger: Roentgen-ray Diagnosis of Internal Conditions. Ten hours. Minimal number of participants 4; maximal 6. Per hour, for all participants taken collectively, 40 schillings. II Medizinische Klinik, Allgemeines Krankenhaus, IX Court. November, 1928, February, March, and May, 1929.

30. Practice Work in the Roentgen Laboratory of the II Medizinische Klinik, IX, Allgemeines Krankenhaus. Daily, from 9:00 A. M. to 1:00 P. M., monthly, 70 schillings. (Austrians without a practice, 25 schillings.) Registration with Dr. Alfred Luger, II Medizinische Klinik. Maximal number of participants 4.

59. "Assistant" Dr. Richard Priesel: I, Roentgen-ray Diagnosis of Internal Diseases of Childhood. II, Roentgen-ray Diagnosis of Skeletal Affections of Childhood. III, Diagnostic Practice for Advanced Students. Each course, 10 hours. Maximal number of participants, each course, 10. Per hour, for all participants taken collectively, each course, 30 schillings. Röntgenlaboratorium der Klinik für Kinderkrankheiten, IX, Lazarettgasse 14. Every month, daily, from 2:00 to 6:00 P. M., after mutual arrangement.

86. Dozent Dr. Max Sgalitzer: I, Roentgen-ray Diagnosis in Urology. Four hours. Twenty-five schillings. II, Roentgen-ray Diagnosis in Surgery. Fifteen hours. With from 6 to 9 participants, 90 schillings; with from 10 to 12 participants, 70 schillings. III, Examination of the Bronchial Tree by Means of a Contrast Medium. One one-half hours. Ten schillings. IV, Myelography, Ventriculography. Three hours. Twenty schillings. Minimal number of participants, each course, 6; maximal, each course, 12. I, Chirurgische Klinik (Röntgenlaboratorium), Allgemeines Krankenhaus. After mutual arrangement.

118. Prof. Dr. Robert O. Stein: Methods of Physical Therapy in the Treatment of Skin and Venereal Diseases (Electrolysis, Roentgen Rays, High Frequency Current, Heliotherapy, Carbon Arc Light, Diathermy, Cold Caution). Ten hours. Minimal number of participants 6; maximal 8. Fifty schillings. Kaiser Franz Josef Ambulatorium and the Jubiläums-spital, VI,

Sandwirtgasse 3-5 (Monday and Friday, from 12:15 to 1:15 P. M.), and Dozenten-saal, Allgemeines Krankenhaus (Wednesday up to 7 P. M.). Every month.

41. Doz. Dr. Julius Weiss: Physical Therapy as Applied to Internal Diseases, with Practical Demonstrations. Minimal number of participants 4; maximal 8. Ten hours. Per hour, for all participants collectively, 30 schillings. Kuranstalt "Elisabethina," IX, Rossauer Lände 37. One course each semester. November-December, 1928; May-June, 1929.

43. "Assistant" Dr. Erich Zdansky: I, Roentgenologic Diagnosis of Heart Disease. II, Roentgenographic Diagnosis of Pulmonary Diseases. III, Roentgenologic Diagnosis of Gastric and Intestinal Diseases. Each course, 10 hours. Minimal number of participants, each course, 8; maximal, each course, 10. Each course, 35 schillings. Roentgen Laboratory of the I Medizinische Klinik, IX, Lazarettgasse 14. Beginning October 15, 1928; every month thereafter. Daily, from 4 to 5 P. M. (or possibly from 5 to 6 P. M.).

Zentralröntgeninstitut Holzkecht, IX, Alserstrasse 4, Allgemeines Krankenhaus.—Training is given in general roentgenology and in the roentgenologic treatment employed in the various specialties. Students will be admitted at any time provided there is space available.

I, Praktikum (practical drill work).—Participation in all forms of treatment (looking on, assisting, doing the work oneself), study plan to accord with the program of each individual student: Professor Holzkecht, in collaboration with his assistants. The "Praktikum" constitutes the chief basis of the special training.

COURSES

1. Doz. Dr. Fritz Pordes: (a) General Roentgenology; (b) Diagnosis and

Treatment of the Teeth and Jaws, and (c) Course in Roentgenologic Sketching and Drawing (Drawer, Zimmermann).

2. Doz. Dr. Robert Lenk: (a) Diagnosis of the Thorax; (b) General and Special Roentgen Therapy (Theoretical Part).

3. Dr. Karl Presser: (a) Practice Course in Roentgen Therapy (for students who are advanced in the theory of the subject); (b) Practice Course in Internal Diagnosis (for advanced students)—(1) thoracic organs, (2) gastro-intestinal tract; (c) Cholecystography. Four hours. Twenty-five schillings.

4. Prof. Dr. Martin Haudek: Diagnosis of the Gastro-intestinal Tract.

5. Doz. Dr. Fritz Eisler: (a) Radiology of the Bones and Joints; (b) Practice Course from Bone Pathology (for advanced students), and (c) Course for Specialists in Diseases of the Bones.

6. Dr. Georg Politzer: (a) Practice Course in Injuries and Disorders of the Skeleton (preconditions are participation in Course 5-a or approval of Professor Holzknecht), and (b) Preparation of Roentgenograms (practice course).

7. Prof. Dr. Artur Schüller: (a) Roentgen Diagnosis in Affections of the Head (for beginners), and (b) the same course for advanced students. Five hours.

8. Dr. Ernst Georg Mayer: (a) Otorhino-ophthalmologic Roentgen Diagnosis (for beginners), and (b) the same course for advanced students. (Presuppositions are participation in Course 7-a or 7-b, or possession of the corresponding preliminary knowledge.)

9. Dr. Hugo Rösler: Diagnosis of the Heart and Blood Vessels (for advanced students). Five to 6 hours for a maximal number of 5 participants. Per student, 30 schillings. Roentgen department of the Herzstation, IX, Pelikangasse 16-18. (Registration also in the Zentralröntgeninstitut.)

10. Dr. Karl Goldhamer (Place: I, Anatomische Lehrkanzel, IX, Währinger Strasse 13): (a) Normal Roentgen Anatomy (from 12 to 15 hours), and (b) Roentgenologic Localization, with Practice Work on the Cadaver (6 hours, December, 1928, until after Easter, 1929). Registration in the Zentralröntgeninstitut.

11. Doz. Dr. Josef Palugyay: Diagnosis and Therapy in Urology. (Röntgeninstitut der II chirurgischen Universitäts-Klinik; registration also in the Zentralröntgeninstitut.)

12. Dr. Martin Jungmann: Diagnosis and Radiologic Therapy in Gynecology. (Röntgeninstitut der II Universitäts-Frauenklinik; registration also in the Zentralröntgeninstitut.)

13. Gottfried Spiegler, Dr. phil.: Physics as it Pertains to Roentgenology; General Technic of Apparatus and General Photography, with Demonstration (from 16 to 18 hours).

14. Josef Rosner, technician: Special Technic of Apparatus, Photography and Practice Work (from 12 to 14 hours).

All courses, with the exception of Physical and General Roentgenology, are open only to those who have had previous training in the specialty or to guests of the institute.

Ten hours will be understood when no further statement is made.

CALIFORNIA X-RAY LABORATORY TO CO-OPERATE WITH BREEDERS

A new X-ray laboratory, for use in plant-breeding experimentation, has been installed at the University of California, and will be available for co-operative researches by workers in other parts of the country. The plan is to have projected experiments sub-

mitted in outline to a special Committee on X-ray Experimentation at the University, and when this committee has given its approval, the pollen or other plant material to be X-rayed will be sent in to the laboratory, treated, and returned to the experimenter, who will observe and report the results obtained. In this way it is hoped to develop new varieties of fruits, crop plants, and ornamentals which otherwise might never have come into existence. At the same time, results of value from the purely scientific viewpoint are expected.—*Science Service.*

GRANTS IN SUPPORT OF RESEARCH ON THE EFFECTS OF RADIATIONS UPON ORGANISMS¹

At the meeting of the Division of Biology and Agriculture of the National Research Council, held in April, 1928, a group of investigators² requested approval by this division of an attempt to obtain funds in support of studies on the "Effects of Radiations upon Organisms."

This project was endorsed by the division and a general committee and a sub-committee on solicitation of funds were immediately appointed, and, later, a sub-committee on allotment of grants.³

Generous response has been met in the

early solicitations and the Committee is able to announce that two contributions of \$12,500 each have been received from the Commonwealth Fund and from the General Education Board. These contributions will be repeated annually for a period of five years, if satisfactory progress can be made in the support of these investigations. Contributions of other funds have been received from manufacturers and also of apparatus, such as X-ray and ultra-violet equipment, and of the loan of radium, totaling in value about \$40,000. It is expected that additional donations will be received. These contributions from manufacturers will be listed in a later announcement by the Committee.

As these funds are now available, investigators, who have worked in this field or who have peculiar qualifications for such research, are invited to present requests for support not later than March 1, 1929, for the period ending May 31, 1930. Application blanks may be obtained about February 1.

The general conditions under which grants of money or apparatus will be made were stated as follows in the proposal approved in April, 1928, by the Research Council:

- I. To be eligible for consideration, an investigator must present evidence, either in the form of published papers or otherwise, that he has a problem well in hand or he must have obvious qualifications to undertake such research. He must also satisfy the Committee that his institution is furnishing reasonable support and equipment for general purposes if not the special features of this work. Time available for the research will be a consideration, particularly in the case of individuals engaged in teaching.
- II. The items for which a grant may be expended will include:
 - (a) Salaries of research assistants, technicians, clerical assistants, and others

¹Reprinted from *Science*, Jan. 4, 1929.

²These individuals were: Edgar Altenburg, H. J. Bagg, A. F. Blakeslee, W. C. Curtis, A. U. Desjardins, C. Stuart Gager, T. H. Goodspeed, Robert F. Hance, F. B. Hanson, E. E. Just, Henry Laurens, C. C. Little, J. W. Mavor, H. J. Muller, Charles Packard, W. J. Robbins, Herman Schneider, George Sperti, L. J. Stadler, Alexander Weinstein, P. H. Whiting.

³The personnel of these committees includes: *General Committee*, W. C. Curtis (Chairman), L. L. Woodruff, and D. H. Tennent; *Sub-committee on Solicitation of Funds*, W. C. Curtis (Chairman), C. C. Little, Herman Schneider, William Crocker, and L. L. Woodruff; *Sub-committee on Allotment of Grants*, D. H. Tennent (Chairman), G. H. Parker, H. S. Jennings, C. E. Allen, W. C. Curtis.

who may be employed in the prosecution of any such investigation.

(b) Purchase of materials, instruments, equipment, etc., such as might not be expected in a laboratory with good general equipment.

(c) Any other assistance, exclusive of the investigator's salary, which any project legitimately requires. Under this head a limited amount may be spent for travelling expenses by the investigator.

(d) The investigator's salary will be paid in full by his institution, which will thus contribute by the time the individual is allowed for research as well as by the general facilities of a well-equipped laboratory. In some instances, however, it may be possible to allow men on sabbatical half-pay a balance on salary account, not to exceed \$2,500 for a twelve-month period.

It is, therefore, intended that the institution in which the investigator is working shall do its share. The Committee hopes to encourage research in smaller institutions and departments, as well as to support work in the largest and best equipped universities and research institutes.

More explicit statement of policy can not be made at the present time. All communications should be addressed to the Division of Biology and Agriculture, National Research Council, B and 21 Streets, Washington, D. C.

W. C. CURTIS, *Chairman*
General Committee on Radiation

Emanation of rays from living cells, which speed up the division of other cells as claimed by the Russian scientist, Dr. Gurwitsch, has been denied by two German plant physiologists at the University of Rostock, Prof. H. von Guttenberg and Dr. Rossman, who repeated the Russian experiments with negative results.—*Science Service*.

BOOK REVIEWS

THE THEORY AND PRACTICE OF RADIOLOGY. By B. J. LEGGETT, M.R.C.S., L.R.C.P., A.M.I.E.E., Radiologist, East London Hospital for Children; City of London Hospital for Diseases of the Heart and Lungs; St. Mark's Hospital for Cancer and Diseases of the Rectum, London. C. V. Mosby Co., St. Louis, 1928.

Vol. I, Electrical Theory Applied to Radiology—238 pages.

Vol. II, Physics and Measurements of X-radiation—308 pages.

Vol. III, X-ray Apparatus and Technology—550 pages.

Vol. IV, Diagnostic and Therapeutic Radiology (in preparation).

The first three volumes are written after the manner of a text-book on the subject, with questions and answers and exercises introduced at the end of each chapter. These questions are general in character and are designed to drill the student in his study of the subject. The three volumes are almost entirely given over to the development and theory of specialized X-ray physics.

Volume I deals with magnetism, electricity, and electro-magnetic machinery. The subject matter completely covers the most exacting needs of the radiologist. The physical laws governing electrical circuits are discussed and the most intricate construction details of electromagnetic apparatus and machinery are demonstrated and explained. The chapter on the Electron Theory is most elaborately developed.

Volume II is devoted to a review of the specialized physics of X-radiation. The physical phenomena attendant upon radiant energy is discussed, starting with light and heat and ending with X-radiation. Of special interest to the radiologist of to-day are the chapters on Measurement of Quality

and Intensity of Radiation. X-ray spectroscopy and ionization methods are most clearly and comprehensively described and all accepted methods and apparatus are illustrated. In this volume a large amount of material has been collected from many sources.

Volume III deals entirely with the apparatus and accessories of practical radiology. The most interesting feature of this volume is the chapter on X-ray tubes, in which the author discusses at length the influence of various types of target, focal point, and other features in design of tubes, on the character of radiation produced. The illustration of apparatus, especially in connection with high voltage therapy, will prove of great interest to all radiologists engaged in this work. The last few chapters of this volume are given over to a consideration of the arrangement and construction of the modern radiology department, a subject which must be the concern of every radiologist in this progressive age.

The volumes here presented are without doubt the most comprehensive undertaking which has ever been attempted in this field in the English language. While the average radiologist may find some difficulty in understanding some of the intricate formulæ introduced here and there in the text, he will find much in the pages of this work which will enlighten and assist him.

L. R. S.

ROENTGEN THERAPY FOR FEEBLEMINDEDNESS IN CHILDREN: PRACTICE OF RADIOLOGY. Vol. X, by DR. WOLFGANG FREIHERR VON WIESER. Published by Otto Nemnich, München, 1928.

In 1923, the author had occasion to study an extensive series of cranial roentgenograms in cases of feeble-mindedness in children. Certain characteristic changes in the region of the sella turcica in many states of congenital and acquired mental deteriora-

tion, which may be construed as due to inflammatory processes, led to the development of the radiation therapy described in the present volume.

The treatment, originally directed only to the pituitary gland, was later modified so as to include irradiation in relatively low dosage of the hypophysis, with the adjacent basal nuclei of the brain, the thyroid, thymus, and genital glands, the posterior root ganglia, and the spinal cord. The treatment has been tested in 571 of 715 juvenile and 217 of 261 adult cases of idiocy or psychic deterioration. The remaining cases of each group constituted a control series. Standards for comparison were based upon studies of 1,500 normal children.

In the earlier period when the treatment consisted of irradiation of the hypophyseal area alone, through two lateral or frontoparietal fields, each receiving 20 to 30 per cent of an erythema dose at the surface, an occasional initial aggravation of symptoms was noted. This was followed in almost every case by an improvement so definite as to be noted by attendants or instructors who were not cognizant of the fact that any form of treatment had been applied. The duration and degree of amelioration increased with successive irradiations at one-month intervals. Because of the occasional untoward initial reaction, as well as a few instances of accumulation effect in the subsequent treatments, the technic was altered, reducing the radiation over each field to approximately 10 per cent of an erythema dose. Additional portals were arranged to cross-fire the hypophysis through two lateral (parietal), one frontal, and one occipital field, and one over the vertex of the skull. Suitable areas are applied over the thymus, thyroid, and genital glands, the posterior root ganglia, and the spinal column. The areas are covered in rotation, a three-to-ten-day interval elapsing between the irradiation of individual fields. Under this plan, no initial retardation occurs, while improvement has been gradual and consistent for

the majority of patients. Supplementary treatment through the administration of various organo-preparations or extracts has been employed in some cases, however, with no better results than have been secured in other instances by irradiation alone. The most satisfactory results have been attained in cases of Mongolian idiocy, while gratifying improvement has occurred in many other types of congenital and acquired mental retardation, among them the dementias resulting from encephalitic disease, or from localized meningeal or brain hemorrhages; the idiocy associated with microcephalia provided the sutures of the cranium are not closed; the periodic manias; psychopathic constitutional disease, and both the dementia precox and catatonic types of schizophrenia. Many cases have been under observation for periods of from one to three years.

The author makes no claim of a cure in any of the conditions treated, but believes that the symptoms may be so controlled that appropriate education may be given and

many of the children made economically self-supporting. The symptoms most markedly influenced are the directly opposite states of erethism and apathy, with a resultant control of the child's attention, making habit-training and education possible. Improvement of the physical state is evidenced by changes in color and turgor of the skin and subcutaneous tissues, and renewed skeletal growth. Muscle spasticity may relax, affording better motor co-ordination, and stereotypic actions become less frequent. A definite change in the psychic state has occurred in many instances.

This work, representing so radical an innovation in the field of mental therapy, will undoubtedly be received with skepticism until substantiated or disproved by other investigators. The data presented, however, are of sufficient promise to warrant careful, though critical, testing in this field in which so few methods of alleviation are known and in which, from humanitarian and economic standpoints, the need of even palliative therapy is so urgent.

ABSTRACTS OF CURRENT LITERATURE

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Cholecystitis and Cholelithiasis in Children. J. A. Beals. *Sou. Med. Jour.*, August, 1928, XXI, 666.

The observation of an instance of gallstones in a three-year-old child led this author to make a study of this subject. In 1923, Kellogg reported 64 cases of gall-bladder disease in children; this author reports and tabulates 60 additional cases from the literature, using the same form of tabulation as Kellogg's, for the sake of convenience in reference. It would be surprising if the gall bladder were not frequently involved in children. It is entirely possible, by using rapid exposure technic, to secure satisfactory roentgenograms of a wriggling child, and there is no reason why the Graham technic should not be applicable to children, especially by the oral route.

W. WARNER WATKINS, M.D.

Regarding X-ray Therapy of the Acute Recurrence of Chronic Osteomyelitis. Max Sgalitzer. *Strahlentherapie*, 1928, XXIX, 311.

The recurrence of chronic osteomyelitis if no sequestra are found may be successfully treated by roentgen rays. Small doses of about 15 per cent E.D. are recommended. The filter used was 5 mm. Al.—no other data given. Two opposite fields are treated with an interval of two or three days.

E. A. POHLE, M.D., PH.D.

The Upright Position and a Vertical Radiographic Unit for Roentgen-ray Examination of the Nasal Accessory Sinuses. Sidney Israel. *Laryngoscope*, September, 1928, XXXVIII, 585.

The author has admirably described and illustrated the upright position and vertical radiographic unit for roentgen-ray examination of the nasal accessory sinuses. He seems to feel that there is a distinct advantage in this position and technic because of its simplicity and ease in producing identical and accurate roentgenograms in each or the same case, the ability to demonstrate a level line

when present, and ease and rapidity in placing the patient, together with the uninterrupted and unmasked projection of the sinus on the film. He claims that facial contour or development does not influence the projection. The apparatus as described by him occupies a minimum of floor space.

B. C. CUSHWAY, M.D.

A Case of Acromegaly. Edward S. Mills. *Can. Med. Assn. Jour.*, March, 1928, XVIII, 278.

This is the report of a typical case. Photographs and radiographs of the skull and hands illustrate the characteristic deformities—prognathos of the lower jaw, enlarged sella turcica, and general bony hypertrophy. In discussing treatment the author states that deep radiation of the hypophysis has been tried, but has not yielded results of any consequence. It is now employed only as a pre-operative measure.

L. J. CARTER, M.D.

On the Knowledge of Radium Hemolysis. Iwao Yamasaki. *Strahlentherapie*, 1928, XXIX, 363.

Hemolysis of erythrocytes of sheep following radium exposure takes place in an atmosphere of nitrogen solution in air. The shorter beta and the gamma radiation were used in the experiments. In some of the tests, the radium hemolysis appeared to be increased in nitrogen atmosphere as compared with the same tests carried out in atmospheric air.

E. A. POHLE, M.D., Ph.D.

Radium Treatment of Vesical Carcinoma. A. Clifford Morson. *Lancet*, July 21, 1928, CCXV, 116-119.

The article is a description of the author's technic for implanting radium needles of platinum 0.5 mm. thick, containing from 10 mgs. to 25 mgs. of radium each. The writer at the time of the implantation passes his hand down about the side of the bladder, between

it and the pelvic wall, so as to delimit the tumor area which is to be implanted and aid the exact location of the needle. He has used sodium fluorescein in one case by injecting it into the tumor before placing the radium, and believes that he saw better results in this one case than in those treated by radium alone. He suggests that this method be repeated to see if it actually sensitizes tumors to radiation sufficiently to warrant its use as a regular procedure. The conclusions are rather pessimistic, as the following definite statements are made: First, vesical carcinoma, in our present state of knowledge, cannot be cured by radiation, but shrinkage of the tumor, even to apparent disappearance, may be expected; second, severe hemorrhage can be controlled, therefore an improvement in the general state of health will follow.

H. J. ULLMANN, M.D.

The Roentgenologic Demonstration of Non-union in the Femoral Neck. P. M. Hickey. *Am. Jour. Roentgenol. and Rad. Ther.*, July, 1928, XX, 14.

As a means of gaining positive X-ray evidence of union in fractures of the neck of the femur where so often no callus can be visualized, films taken with the hip in extreme abduction and adduction are suggested, the pelvis being immobilized throughout the procedure. If the relationship of the fragments remains unchanged one may feel reasonably sure that union has occurred, whereas in those cases showing a change in relationship of the fragments it may be said that there is non-union.

J. E. HABBE, M.D.

Physicochemical Investigations of Irradiated Proteins. III.—A Contribution Concerning the Determination of the Light Coagulation Velocity of a Number of Proteins. Mona Spiegel-Adolf. *Strahlentherapie*, 1928, XXIX, 367.

The coagulation of proteins under the influence of ultra-violet light has been studied. A mercury vapor lamp running at 200 K.V.,

D.C., and 2.8 ma. [undoubtedly, this must mean 220 V., D.C., and 2.8 amperes], served as source of radiation. The solutions were placed in quartz vessels of one centimeter diameter and exposed at a distance of 80 cm. from the lamp. No water-cooling was, therefore, required. The intensity of light could be recorded with a cadmium photo-electric cell connected to a galvanometer in an amplification circuit. The coagulation velocity under the influence of light decreased with increasing dilution. Addition of salt retards the beginning of visible coagulation. In all proteins examined, the coagulation velocity decreased from pseudoglobulin to ovalbumin down to serum-albumin.

E. A. POHLE, M.D., PH.D.

Epiphyseal Coxa Vara. Morris K. Smith.
Am. Jour. Surg., October, 1928, V, 387.

The author describes the condition which is frequently discussed under the name of "slipping epiphysis" of the hip. He believes that the etiology is best explained by softening at the junction of the epiphyseal cartilage and the neck. He also suggests the possibility of an endocrine involvement in a certain number of these cases. In an adolescent, particularly a boy of the stout type who complains of pain in the hip associated with limp without adequate traumatic basis, this condition should be considered and a roentgenogram made, as well as a careful physical examination.

H. P. DOUB, M.D.

Regarding the First Tuberculous Infection of Childhood. E. Rominger. Ztschr. f. Tuberkulose, 1928, Band 50, Heft 2, p. 113.

There is no doubt but that under usual circumstances the first infiltration and colony of tubercle bacilli in the child's lungs may lead to no definite train of clinical symptoms. The author has come to this conclusion after repeatedly observing positive tuberculin tests on

children who have never been sick at any time. He describes at length the clinical and roentgen findings in two cases in which he was fortunate enough to observe the development of a primary tuberculosis from negative tuberculin reaction, through all the characteristic lung changes to positive allergic manifestations. The first case was under close clinical observation within a few weeks after a definite exposure to a tuberculous aunt. Roentgen findings showed a soft cloudy shadow about both hili, interpreted by the author as the acute stage of a primary tuberculous infection. The infiltration at the right hilus extended toward the diaphragm to meet a soft, wedge-shaped shadow, widest at its periphery. No calcifications were noticed in any part of the lungs. The intra-cutaneous tuberculin 1-10,000 had been negative up to this time. The leukocyte count was 10,200. A high temperature had been present for eight days before admission. After repeatedly negative responses to intra-cutaneous tuberculin a positive reaction was obtained five days after admission. Fever then disappeared. A roentgen check of the chest was made twelve days after the first film. The hilus infiltrations then appeared harder and more marked and the infiltration over the right diaphragm was more isolated. From the entrance of the first bacilli (due to the known exposure) to the first positive tuberculin test was between 29 and 47 days.

The second case reported was a child of 6½ years who showed general muscular weakness and malnutrition but no organic findings. The tuberculin test was negative and she had no elevation of temperature. Symptoms of her apathy had been present for fourteen days. Roentgenograms of the chest revealed a large dense shadow at the left hilus. A repetition of the intra-cutaneous tuberculin now gave a ++ positive reaction, in 1-100,000 dilution. Further history revealed an exposure to a child with an adult type of tuberculosis just before the last admission. Thus the time for appearance of clinical symptoms was between 12 and 40 days after the infection in one case and between 25 and 45 days in the other. The first positive intra-cutaneous

tuberculin test was 29 to 47 days after infection in one case and 40 to 60 days in the other. The first changes in the roentgen picture were 21 to 40 days after infection in the first case and 40 to 60 days in the second.

The author felt that the report of these two cases offered definite evidence as to the period of incubation in primary tuberculous infections. He states that the shortest reported incubation period is in a case of Epstein's, where 8 days was the period noted.

M. J. GEYMAN, M.D.

Biologic Investigations on the Influence of Dust and Dirt on the Transparency of Quartz Plates in the Ultra-violet Region. Zembei Oshima. Strahlentherapie, 1928, XXIX, 358.

Radiation, coming from a mercury vapor lamp, which had passed through dusty and dirty quartz plates, had the same erythema effect as the radiation coming from the lamp directly. The action on *Bacillus prodigiosus* was also not appreciably influenced. The hemolytic effect, however, was reduced somewhat after the radiation had passed the dusty quartz plates. The variance in these experiments is explained by the different degrees of sensitivity of the biological objects to ultra-violet rays of short wave length (Sonne).

E. A. POHLE, M.D., PH.D.

Roentgen Therapy of Gliomas of the Brain. Percival Bailey, Merrill C. Sosman, and Arthur Van Dessel. Am. Jour. Roentgenol. and Rad. Ther., March, 1928, XIX, 203.

With the possible exception of pituitary adenomas, operation should precede roentgen treatment in all cases of suspected brain tumors; extirpation of the tumor should be done if it can be localized, otherwise a decompression is indicated. Should roentgen therapy be instituted without previous surgery, it is not always certain that we are dealing with

a brain tumor. Even if present, it has not been positively localized. Its nature may be such as to make it much more amenable to surgery than to roentgen therapy, and the X-radiation may aggravate the symptoms or even cause the death of the patient because of the cerebral edema induced.

Twelve medulloblastomas treated by surgery and post-operative radiation survived for an average period of 34 months following recognition by surgical removal and microscopic study, whereas the average survival period of medulloblastomas untreated is only 15 months.

Fifteen spongioblastomas showed in some instances temporary improvement and relief of symptoms, the average duration of the treated cases being 19 months, whereas the average survival period for untreated tumors of this type is 12 months.

Sixteen protoplasmic astrocytomas received X-ray therapy in addition to surgery, but there was no convincing proof that irradiation increased the length of life in these patients. Several cases, however, showed marked amelioration of symptoms directly attributable to the irradiation administered. However, this type of tumor is still being routinely radiated following operation because of the possibility of malignant transformation, but with the recurrence of symptoms a second operation should be performed because of the probability of recurrence being due to mechanical cause such as blockage of cerebrospinal fluid, hemorrhage into the tumor, or cystic degeneration.

Ten fibrillary astrocytomas received post-operative radiation without certain beneficial effects in any case, and in two cases radiation was discontinued after having given rise to disagreeable reactions. In the light of these experiences and with the knowledge that these relatively benign tumors give rise to symptoms almost entirely from mechanical causes, post-operative radiation is not advocated for this type of tumor.

Three astroblastomas were treated post-operatively without proof of their being influenced by irradiation, but X-ray treatment is indicated, according to the authors, because of

the tendency of this type of tumor to recur after removal.

Three oligodendrogliomas were treated without definite benefits except in one case, where irradiation effected a subsidence of the cerebral hernia through the decompression opening.

Three ependymomas were treated post-operatively with no definitely beneficial results.

J. E. HABBE, M.D.

Gastric Polyposis: A Report of Two Cases, with a Review of the Literature. A. A. Strauss, J. Meyer, and A. Bloom. *Am. Jour. Med. Sci.*, November, 1928, CLXXVI, 681.

The writers report two cases of gastric polyposis, proven at operation. They then discuss the etiology, incidence, diagnosis, complications, and treatment. The clinical picture of gastric polyposis, while not definitely characteristic, is suggested by the story of a chronic gastric discomfort, repeated gastric hemorrhage, achylia gastrica, increased or normal gastric motility, abnormal amounts of gastric mucus of egg-white consistency, and the characteristic mottling on the X-ray film.

R. A. ARENS, M.D.

The Rheumatic Lung. A. E. Naish. *Lancet*, July 7, 1928, CCXV, No. 5471, 10.

The author describes a type of pulmonary consolidation to which he applies the term "rheumatic lung." His study is based on the postmortem material of six cases that gave evidence of active rheumatic infection, particularly in the heart.

The consolidation is due to an enormous endothelial proliferation, the cells apparently originating from the walls of the alveolar capillaries. The consolidation commonly starts at the left base and is confined to this region in mild cases. The process may become quite massive and very little respiratory distress occurs until the consolidation is enormous.

In his summary the author states that this

type of consolidation probably accounts for that met with at the left base in cases of rheumatic carditis. Histories and findings are given, but no roentgen examinations were made. Roentgenograms should prove an informative adjunct to the clinical and pathologic study of the condition described.

M. J. GEYMAN, M.D.

The Distribution of Gamma Radiation in Space, and its Measurement for Therapeutic Purposes. E. Kessler and F. Sluys. *Strahlentherapie*, 1928, XXIX, 385.

This is a discussion of an ionization instrument for measuring the dose of radium, and of isodose curves obtained from a radium bomb. The application is described and supplemented by a liberal number of good illustrations.

E. A. POHLE, M.D., PH.D.

Fluoroscopic Examination of the Paranasal Sinuses: Some Clinical Notes. Robert A. Powers. *Calif. and West. Med.*, November, 1928, XXIX, 338.

Dr. Powers makes a routine of doing fluoroscopy of the sinuses in all cases of respiratory infection. Many of these have been checked by roentgenographs. Fluoroscopy of the sinuses is not an exact method of examination or a substitute for the films, but by it one may uncover many conditions not otherwise found. Fifty-six cases were examined by both screen and plate, sinus disease being suspected in forty-four fluoroscopies and present on the films in thirty-three cases. Poor accommodation of the eyes was probably responsible for most of the errors in these cases.

F. B. SHELDON, M.D.

Results in the X-ray Treatment of Skin Cancer. W. S. Lawrence. *Sou. Med. Jour.*, July, 1928, XXI, 514.

This author reports a series of cases, with illustrations, showing the good results to be obtained by means of X-ray therapy in

skin cancer. The paper is by way of answer to the statement of a "prominent dermatologist" that radium and not X-ray should be used in such conditions.

W. WARNER WATKINS, M.D.

Roentgenological Aid in the Diagnosis of Ileus. James T. Case. *Am. Jour. Roentgenol. and Rad. Ther.*, May, 1928, XIX, 413.

The author recognizes the value of the many important clinical signs of acute post-operative ileus, but re-emphasizes the value of a simple bedside roentgenogram by which means many cases of suspected ileus can be definitely recognized. The technic of the examination must be kept very simple, because, in most cases, the patient is not in a condition to be subjected to much disturbance. Ordinarily no opaque meal or enema is administered, the patient being carefully lifted on the draw-sheet and the cassette placed beneath him without turning him on his face or forcing him to sit up. Only rarely is it necessary to turn the patient on his side for a second film or to administer a small barium meal or enema.

The X-ray diagnosis of obstruction rests upon the recognition of dilated loops of small intestine which present a "herring-bone" aspect or a "ladder pattern." These gas accumulations are usually centrally located in the abdomen, in contrast with the peripherally located gas accumulations in the large bowel, where haustral markings are also usually recognizable, or the gas in the stomach, which extends high up under the left diaphragm. At times the film will afford considerable information as to whether the obstruction is high up or low down in the small bowel.

J. E. HABBE, M.D.

Regarding Radiation Therapy of Warts. Stefan Brünauer. *Strahlentherapie*, 1928, XXIX, 255.

Stubborn warts were treated by a radium preparation—linen was impregnated, 100

square centimeters containing one milligram radium bromide. The linen was placed on the warts over night, about six hours daily for the period of one week. The results were excellent. It is believed that the effect is due to the alpha and beta radiation.

E. A. POHLE, M.D., PH.D.

Ocular Involvement in Sinus Diseases. Edgar S. Thomson. *Laryngoscope*, August, 1928, XXXVIII, 521.

The author, in reporting a series of forty-four cases and case histories, emphasizes the frequency with which sinus disease causes iritis, cyclitis, retinitis, and choroiditis, and with almost as great frequency causes an optic neuritis. In his series of cases X-ray films were taken, general examination made, and Wassermann reactions taken. The changes noted on X-ray films of the sinuses are often very slight. He feels that the closest co-operation is essential between the ophthalmologist and rhinologist to secure the best results, also the prompt treatment by operation of affected sinuses, as the dangers of a correctly done sinus operation are not so great as to justify a temporizing course where the integrity of the eye is endangered. He finds that if treatment can be promptly instituted, results of operation are excellent and in many cases remarkable even in the late cases.

B. C. CUSHWAY, M.D.

Multiple Superficial Ulcers of the Small Intestine. K. Kanagarayer. *Lancet*, July 7, 1928, CCXV, No. 5471, 16.

Three cases are reported of non-tuberculous, non-syphilitic ulceration between the duodenum and to within several feet of the ileocecal valve. Complaints were all of abdominal pain, with diarrhea. The ulcers on postmortem examination all showed tendency to healing. The anatomical resemblance to tuberculous lesions is suggested by the transverse course of the ulceration, but the lymphoid nodules are not involved, as they are in

typhoid and tuberculosis. Cultures in one case yielded coliform organisms. The author suggests that roentgen examination might have helped in a premortem diagnosis.

M. J. GEYMAN, M.D.

Roentgenologic Manifestations in Eighty-seven Cases of Gastric Syphilis. Alexander B. Moore and Richard Aurelius. *Am. Jour. Roentgenol. and Rad. Ther.*, May, 1928, XIX, 425.

While three types of gastric syphilis actually occur, syphilitic gastritis reveals no definite roentgen signs, and the simple round ulcer often thought to be of luetic origin cannot be regularly proved to be so; hence, the roentgenologic manifestations in this series of cases have to do primarily with the gummatous hyperplastic type. Absolute histologic proof is seldom obtained, the diagnosis being determined by the clinical, X-ray, and laboratory findings and the response of the patient to anti-luetic treatment.

The great majority of the cases in this series were men in the fourth or fifth age period, and the usual clinical findings were marked weight loss, epigastric pain, vomiting, achlorhydria, anemia, but rarely hematemesis. Three roentgenologic types may be recognized: 70 per cent showed a pre-pyloric narrowing; 22 per cent showed the lesion confined to the middle third, producing hour-glass deformity, and 8 per cent showed diffuse narrowing of the gastric lumen. The area of narrowing is usually a concentric, symmetric filling defect which presents relatively smooth borders and for which there is no corresponding palpable tumor. Lessened flexibility without lessened mobility, and absence of peristalsis in the involved area without six-hour retention, are associated findings.

J. E. HABBE, M.D.

Legg's Disease in its Late Stage. Solomon D. David. *Sou. Med. Jour.*, July, 1928, XXI, 522.

The terminal stage of this disease has not been fully understood, perhaps because suffi-

cient time has not elapsed since it was first described by Legg in 1909, to observe many cases in the terminal stages. The author describes five cases of the condition observed in the adult (ages 15 to 45), which he thinks may be old conditions, representing the terminal stages of childhood lesions.

W. WARNER WATKINS, M.D.

On the Bactericidal Effect of Roentgen Rays and its Dependence upon External Factors. W. E. Pauli and E. Sulger. *Strahlentherapie*, 1928, XXIX, 128.

The bactericidal effect of roentgen rays was studied on cultures of pyocyanus and staphylococcus. Filtered radiation (0.33 millimeter Zn.) at 124 K.V., 10 cm. distance, delivering 100 R in 46 seconds, was used. The exposure time ranged from 29 minutes to four and a quarter hours. It appeared that the effect was dependent upon the temperature. This is explained by the fact that the sensibility of the micro-organisms is higher in the stage of increased mitosis. An extension of the applied dose over a longer time increased the effect considerably. The presence of colloids also increased the effect, evidently due to their secondary radiation.

E. A. POHLE, M.D.

Giant-celled Tumor of the Neck of the Femur: Operation, with Probable Cure. W. G. Turner. *Can. Med. Assn. Jour.*, September, 1928, XIX, 342.

This is a case report in which a roentgenogram shows marked rarefaction and a coxa vara. Following a pathologic fracture, the joint was opened surgically, the jelly-like contents of the cystic area in the neck removed, and the cavity filled with bone slivers chiselled off the ilium. Four years later the patient was able to walk with a slight limp, without pain, and with full range of movement. The roentgenogram shows a new osseous structure replacing the original neck of the femur.

L. J. CARTER, M.D.

Experiences Regarding the Increase of the Effect of Roentgen Rays by Dextrocid Injections. Josef Jacobs. *Strahlentherapie*, 1928, XXIX, 403.

Dextrocid (iodin-Cer-compound, coupled to a 30 to 50 per cent dextrose solution) was injected intravenously in a number of cases of malignant disease and combined with radiation therapy. Less radiation was required to get the same results. It is assumed, therefore, that this compound sensitizes the tumor. Its use in Hodgkin's disease is particularly recommended.

E. A. POHLE, M.D., Ph.D.

Roentgen-ray and Radium Treatment of Plantar Warts. Henry H. Hazen. *Am. Jour. Roentgenol. and Rad. Ther.*, May, 1928, XIX, 440.

Plantar warts are so frequent and usually so painful that any certain and painless method of removal should be welcomed. Roentgen therapy alone was sufficient to cure 112 of a series of 120 cases. A small percentage of cases that do not respond to the X-ray may be successfully treated by radium. The author's factors for solitary warts are: $7\frac{1}{2}$ inch spark gap, 10 inch distance, and 16 milliamperes minutes. Ordinarily no filter is used; if the wart is embedded in a heavy callus, 1 to 2 millimeters of aluminum is employed. The average number of treatments was three, with seven being the maximum number to any patient.

J. E. HABBE, M.D.

A Note on Ultra-violet Radiation in the Treatment of Pemphigus Neonatorum. A. W. Gregorson. *Lancet*, April 7, 1928, CCXIV, No. 5458, 703.

The author has found that a series of cases treated by ultra-violet with a mercury vapor lamp used twice a week at a distance of two feet for three minutes, increasing one minute of treatment to six minutes, has resulted in cutting short the course of the disease very markedly. In addition, he has found that the most successful procedure during the treat-

ment is to keep the infant dry and avoid bathing of any form. The necessary toilet is carried out with oil and dryness is maintained over the whole body. Bathing spreads the disease. He has tried ointments, lotions, and powders in various combinations without encouraging results. He recommends ultra-violet radiation as being efficient and easy of application, cutting short the disease, and invaluable in removing a source of anxiety to the mother.

H. J. ULLMANN, M.D.

The Dosimetry of Grenz Rays in R-units with the Standard Instrument of Kuestner. G. H. Kloeveborn. *Strahlentherapie*, 1928, XXIX, 190.

The potential at the terminals of a low voltage tube (6 to 12 K.V.) does not define the quality of the emitted radiation. It is necessary to measure the absorption in some light material, for instance, cellon. Clinical tests showed that 1,480 R (32 per cent absorption in 0.2 millimeter cellon) and 1,630 R (27.5 per cent absorption in 0.2 millimeter cellon) produced the same erythema after seventy-two hours.

E. A. POHLE, M.D.

Cancer of the Intestine: A Clinical Study. Richard Warren. *Lancet*, Sept. 8, 1928, CCXV, 493.

The author reports the observations on and operative results in sixty-nine cases of intestinal carcinoma. Of these, two were in the small intestine, twelve between the cecum and hepatic flexure, four in the transverse colon, twenty in the descending colon, and thirty-one in the sigmoid.

The commonest earlier symptoms were pain, meteorism, constipation, and diarrhea, with an occasional palpable tumor. Later, the manifestations of more acute obstruction were present.

Roentgen examination was found valuable in checking the clinical findings. In fifty-seven cases colostomy or lateral anastomosis

alone was done at the first operation. Later excision of the growth was done on the cases surviving colostomy or anastomosis. The mortality was only 30 per cent in secondary resection as compared to 60 per cent in resection and colostomy at the first operation.

In his conclusions Dr. Warren states that only about half of his series comes to examination early enough to warrant radical removal and the delay in seeking treatment is the cause for such high mortality.

M. J. GEYMAN, M.D.

Uncertainties of Cholecystography. W. W. Boardman. *Am. Jour. Med. Sci.*, September, 1928, CLXXVI, 383.

The writer discusses the various factors which contribute to a successful cholecystogram. These are: (1) A sufficient concentration of the dye in the blood stream; (2) a liver capable of excreting the dye; (3) patent common and cystic duct; (4) a gall bladder capable of receiving and discharging the dye; (5) a gall bladder capable of concentrating the dye; (6) a properly functioning sphincter mechanism at the lower end of the common duct. A change in any of these factors would produce a lack of filling of the gall bladder. The author reports six cases in which the Graham-Cole test failed to agree after two separate intravenous administrations.

R. A. ARENS, M.D.

Osteochondritis Dissecans. G. E. Richards. *Am. Jour. Roentgenol. and Rad. Ther.*, March, 1928, XIX, 278.

Osteochondritis dissecans is a disease process in the ends of long bones, wherein there separate from the joint ends small fragments which become covered with dense connective tissue and usually lie within the recess produced by their separation. Their etiology is somewhat uncertain; however, because the author has found them occurring in the elbow and hip as well as the common location in the knee, and usually with a history of preceding injury, he believes trauma to be the causative factor.

A case is reported of a male, aged 16 at the time of the examination, who, when 14, had been injured by being thrown from a disc harrow. Five weeks subsequent to the injury the injured hip was roentgenographed and pronounced normal; however, he had had difficulty in walking ever since the accident. Roentgen examination at the time of the report (two years after injury) showed an area on the superior articulating surface of the femur, about $\frac{3}{4}$ by $\frac{1}{2}$ inch, in which a sharply outlined area of destruction was present, irregularly oval in shape, and in the center of this shallow depression lay a thin plate of bone or sequestrum. The X-ray diagnosis was osteochondritis dissecans.

At operation the hip joint was opened and the head of the femur exposed. A thin sequestrum about $\frac{1}{2}$ by $\frac{1}{2}$ inch was seen on the head of the bone, there being a distinct line of demarcation of its edge from the surrounding cartilage. Following removal, recovery was uneventful. The pathological report was osteochondritis dissecans, in agreement with the X-ray diagnosis.

J. E. HABBE, M.D.

Which Type of Pointed Condyloma should be Treated by Roentgen Rays? R. O. Stein. *Strahlentherapie*, 1928, XXIX, 263.

Condylomata of the fast growing, cauliflower type responded very well to roentgen rays. The surgical removal is difficult because of the excessive bleeding. Small, pointed condylomata were highly resistant. *Technic*: 7 H through 3 Al., with intervals of six or eight weeks.

E. A. POHLE, M.D., PH.D.

A Report of a Case of Congenital Malformation of the Gastro-intestinal Tract. A. B. LeMesurier and F. F. Tisdall. *Can. Med. Assn. Jour.*, May, 1928, XVIII, 576.

The most common deformity is the failure of the colon to rotate to the right. The case reported is a much rarer condition—the failure of the stomach to rotate to the left.

The patient, a child of three weeks, was

examined radiologically by Dr. A. H. Rolph, with the following findings: The stomach and duodenum comprised one large sac, which occupied the right upper abdomen, and was completely transposed. The spleen was on the right side in relation to the fundus of the stomach. The foramen of Winslow was three inches in diameter. The lesser peritoneal sac was unusually large. The small bowel, from the duodeno-jejunal junction to the terminal ileum, was herniated into the lesser peritoneal sac. The colon was entirely in the left abdomen, the cecum and appendix being situated high up and upside down. The thoracic contents were normally situated.

L. J. CARTER, M.D.

Complications Following the Application of Radium to Pelvic Lesions. Leda J. Stacy. *Am. Jour. Roentgenol. and Rad. Ther.*, April, 1928, XIX, 323.

Slight malaise, nausea, sometimes with vomiting and slight diarrhea, which occur immediately after the use of radium and last from 24 to 36 hours are so common and transient that they are considered normal and do not require consideration. However, with large dosage applied to extensive malignancies an irradiation acidosis plus at times a starvation acidosis occurs; therefore, a basic diet is indicated.

Pelvic cellulitis and peritonitis are the other common complications following the use of radium in cervical carcinoma; hemorrhage is an infrequent one. In order to avoid such complications patients in the third and fourth group (Schmitz classification) are prepared by bed rest, forced feeding, blood transfusion if the patient is anemic, and hot douches for a few days before radium treatment is begun. The first two treatments are usually light ones and in some instances treatment is discontinued for a period of a few weeks, after which it may be more safely completed. When cellulitis develops the case is treated as any other case of peritonitis, and pelvic abscess is carefully watched for, and, if found, is drained.

All patients in the third and fourth groups should also be carefully studied for stricture

of the ureter and hydronephrosis. A ureter partially obstructed before radium therapy may become completely occluded from edema, and if the opposite kidney does not have an adequate function, uremia follows.

In carcinoma of the cervix where there is considerable narrowing of the lumen of rectum or rectosigmoid juncture, the edema resulting from full course of radium may produce obstruction and necessitate a colostomy.

In cases where the mucosa of the bladder is edematous, treatment of the cervical carcinoma may have to be modified in order to avoid the production of a vesicovaginal fistula.

Sequelæ following irradiation for carcinoma of the cervix consist of trophic ulcers of the rectum or bladder and cervical stenosis, with pyometritis. Such ulcers may not occur for months following radiation, and, in many, biopsy alone will prove whether the ulcer is simply inflammatory or represents malignant extension.

The commonest complications following radium treatment of benign pelvic lesions are pelvic cellulitis or the lighting up of a quiescent salpingitis. History of previous salpingitis is a contra-indication to the use of radium. Surgery or X-ray therapy is to be preferred in such cases.

J. E. HABBE, M.D.

The Management of Uterine Malignancies at the Radium Institute of the University of Paris. George T. Pack. *Sou. Med. Jour.*, July, 1928, XXI, 505.

This paper reports observations of the technic of management of uterine malignancies at the Radium Institute in Paris. The therapeutic indications at this Institute are as follows: (1) Cancers deemed best for surgery but not absolutely confined to surgery are (a) adenocarcinoma of the cervix; (b) cancers coincident with adnexal infection; (c) cancers persisting after the failure of a preceding radium therapy; (d) cancers coincident with vaginal malformations of certain types. (2) All other operable cases in good condition are treated by utero-vaginal radium therapy in preference to hysterectomy. (3) Hysterectomy after radium therapy is recom-

mended only in cases which were operable before radium treatment. (4) Hysterectomy followed by radium therapy is not recommended except in those rare instances where malformations or occlusions of the vagina and uterus exist. (5) Roentgen therapy alone or external radium at a distance is the method of choice in inoperable cases, where the condition of uterus and vagina does not permit correct radium usage; this is necessary in recurrence following hysterectomy. (6) The association of X-rays or radium at a distance with radium applied utero-vaginally is the correct method when the parametrium is invaded.

In using X-rays in conjunction with radium, it is considered important that the X-ray treatment be given prior to the radium applications. X-ray treatment given following radium is much more inefficient.

The technic of Regaud of extending the period of internal therapy with radium over a period of six or ten days is described, the reason for this being that a long irradiation, or repeated doses during a certain time, will destroy the dividing cancer cells successively. The usual dose of internally applied radium is 50 "millicuries destroyed," which is equivalent to 6,650 milligram-hours, although as much as 8,000 milligram-hours may be administered by using six foci.

That radiotherapy is not to be undertaken lightly is illustrated by the contra-indications, which are: (a) a state of radioresistance following a series of previous treatments; (b) the existence of a local or general infectious state not possible of suppression; (c) cachexia caused by anemia following repeated hemorrhages or uremia from compression of ureters; (d) concomitant grave, chronic or acute affections, such as diabetes, Bright's disease, cirrhosis of the liver, cardiopathy, pulmonary tuberculosis; (e) generalization of the cancer to peritoneum, etc. (Several of these are used by surgeons as indications for advising radium.)

W. WARNER WATKINS, M.D.

Subpleural Emphysema as a Causative Factor in the Formation of Annular Shad-

ows. Howard P. Doub. Am. Jour. Roentgenol. and Rad. Ther., July, 1928, XX, 6.

Besides true cavities, circumscribed pneumothoraces caused by lung rupture, and subacute pleuritis which may be associated with umbilication of the underlying lung, the author believes that annular shadows on the chest roentgenogram may be produced by emphysematous blebs and bullae. Blebs, which are sub-pleural emphysemas, are caused by a rupture of some superficial pulmonary alveoli, allowing the air to escape into the pleura which is separated from the underlying lung. Bullae are more deeply seated pulmonary emphysemas, with the overlying pleura intact. Any condition of the chest which results in long-standing increase of intrapulmonary pressure may result in their formation. In the author's series, several cases showed malignant growths in the region of a bronchus. On the X-ray film they are seen as irregularly rounded shadows of decreased density, which are usually multiple and in the lower lung. A commonly associated finding is generalized emphysema. Five cases illustrating the antemortem and postmortem findings are reported. While the author feels that in many cases bullae and blebs should be successfully differentiated from true cavities, in the tuberculous chest cavities and blebs or bullae may frequently co-exist.

J. E. HABBE, M.D.

On a New Treatment Method of Senile Pruritus. J. Borak. Strahlentherapie, 1928, XXIX, 245.

In this article, the theory is advanced that senile pruritus is due to a metabolic disturbance. An attempt was made, therefore, to influence the disease by irradiation of the thyroid or hypophysis. A total of ten cases was treated; eight of these were of the senile type (seven exposed over the hypophysis, one over the thyroid), and all were cured, without recurrence, for a period of two and a half years. Two younger patients were suffering from a generalized pruritus. They also were relieved by the treatment. *Technic:* Two temporal fields with 200 R (primary energy)

each, 0.3 to 0.5 Zn. for the hypophysis; 60 *R* per field through 4.0 Al., not exceeding a total of 120 *R* over the thyroid.

E. A. POHLE, M.D., PH.D.

On Acne Vulgaris. D. E. H. Cleveland. *Can. Med. Assn. Jour.*, March, 1928, XVIII, 261.

The X-ray is one of the most useful remedies, using unfiltered radiation, with the eyebrows, hair, and front of the neck screened off with lead. One-eighth of a skin unit (MacKee) is given to the central parts of the face, and one-fourth to each lateral aspect, once weekly. Eight to twelve such treatments are ordinarily given. X-ray erythema is to be avoided at all costs. The contra-indications to X-ray treatment are the presence of many freckles, or small brown pigmented moles, or pustulation.

L. J. CARTER, M.D.

A Practical Measuring Instrument for the Dosage of Ultra-violet Rays. B. Rajewsky. *Strahlentherapie*, 1928, XXIX, 180.

This is a description of a measuring instrument for ultra-violet rays. It consists of an ionization chamber which has a cadmium electrode and a quartz window. The photo-electrons released by the cadmium furnish the

ionization current. It can be connected to any electrometer, as, for instance, an electroscope. The author announces that he will make an attempt to adapt the sensitivity curve of the instrument to the sensitivity of the skin, in accordance with Hausser and Vahle's experiments.

E. A. POHLE, M.D., PH.D.

Treatment of Pain in Carcinoma of the Cervix Uteri, with Special Reference to Stricture of the Ureter. Charles L. Martin. *Am. Jour. Roentgenol. and Rad. Ther.*, July, 1928, XX, 30.

Malignant stricture of the ureter is a commoner cause of pain in cases of carcinoma of the cervix than pelvic peritonitis or stenosis of the cervical canal. Such strictures may not always be recognized by the urologist at the time of catheterization, but if a pyelogram is made the hydronephrosis will be demonstrated. The pain produced by these strictures can usually be relieved by dilatation of the strictures with a Walther dilator or by a catheter of moderate size with a wax bulb attached. Occasionally only very temporary relief is secured, but if the dilatation is adequate and is combined with irradiation of the broad ligament areas the patient may be rendered symptom-free for a year or longer.

J. E. HABBE, M.D.

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